# Montana
# Farmers' Bulletin
## (No. 3)

## Poultry Keeping on the Farm

Published by the Office of
MONTANA FARMERS' INSTITUTES
Edited by F. S. COOLEY, Supt.

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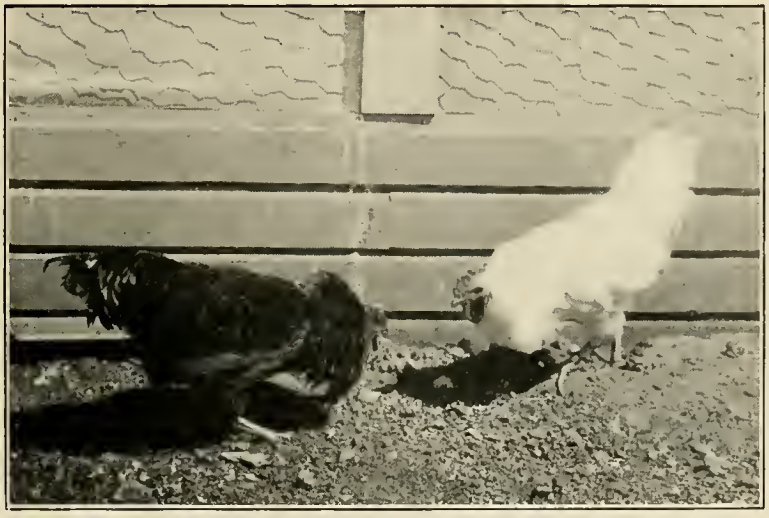

WHO'S BOSS?

## Poultry Keeping on the Farm

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## ACKNOWLEDGEMENTS.

In presenting this publication on Poultry Keeping on the Farm, we beg to gratefully acknowledge the valuable contributions by Edmund Burke and Wm. F. Schoppe of the Montana Experiment Station; Dr. A. A. Brigham, Principal of the South Dakota School of Agriculture; Prof. Chas. K. Graham, Director Hampton Virginia Normal and Agricultural Institute; I. K. Felch, veteran breeder, showman and judge; Prof. James Dryden, Agricultural College, Corvallis, Oregon; Prof. D. J. Lambert and Wm. K. Fitzpatrick of the Rhode Island Experiment Station; A. F. Hunter, Associate Editor of American Poultry Advocate; and Thomas Wright of Marlboro, Massachusetts.

We are also greatly indebted to Farm-Poultry for many of the illustrations generously loaned for use in this book.

# List of Illustrations

# Contents

# Foreword

Although individually a small subject, the aggregate product of the farm hen in America amounts up well towards half a billion dollars, and poultry keeping ranks as one of the most important agricultural industries. Moreover, the universality of the poultry interest strongly supports the plan of disseminating information in regard to it.

The present volume—one of a series pertaining to specific farm matters—is prepared with view to increasing the general information of poultry keepers in Montana. Of necessity many topics are treated in a very fragmentary manner or omitted altogether. Space does not permit an exhaustive discussion of all matters pertaining to poultry keeping and management.

The reader, if he wishes to delve more deeply into poultry literature, must look to the standard works upon the subject. Such books as PRACTICAL POULTRY KEEPING, by Brigham, published by the Torch Press, Cedar Rapids, Ia.; POULTRY CRAFT, by Robinson, published by Farm Poultry, Boston; FARM POULTRY, by Watson, published by Macmillan Company, New York; PERFECTED POULTRY OF AMERICA, by McGrew & Howard, published by the Howard Publishing Company, Washington, etc.

Many farmers' bulletins issued by the U. S. Department of Agriculture, Washington, D. C., deal with poultry topics and should be in the hands of every farmer in the United States. The following Farmers' Bulletins are of interest in this connection:

41. Fowls, Care and Feeding.
51. Standard Varieties of Chickens.

64. Ducks and Geese.
128. Eggs, Their Uses as Food.
141. Poultry Raising on the Farm.
177. Squab Raising.
182. Poultry as Food.
200. Turkeys.
234. The Guinea Fowl.
236. Incubation and Incubators.
287. Poultry Management.

Write to Division of Publications, U. S. Department of Agriculture, for the foregoing.

Farmers' Bulletin No. 357 has been secured and bound in with this volume, as one of the best general write ups of poultry investigations available.

We trust the reader will appreciate the desire for service which prompts this effort, and feel assured that every opportunity to extend that service and supplement the work will be appreciated by the editor.

# CHAPTER I.

## STANDARD VARIETIES OF CHICKENS.

By F. S. COOLEY

An extended discussion of the origin and characteristics, with descriptions of the varieties of chickens, would fill a volume. Books such as "American Standard of Perfection" and "Perfected Poultry of America," deal exclusively with this subject. To treat at length or to ignore the subject entirely, would be equally out of harmony with the purposes of this book. We therefore make mention of most of the varieties of chickens found in America, and very briefly notice some of their important features and characteristics.

For purposes of systematic arrangement, we will group the various breeds of chickens into I., Meat Breeds; II., General Purpose Breeds; III., Egg Breeds; and IV, Ornamental Breeds.

Section 1. Meat Breeds is nearly synonymous with the Asiatic class and includes the following:

- Meat Breeds.
  - Asiatic.
    - Brahmas. (Light. Dark.)
    - Cochin. (Buff. Partridge. White. Black.)
    - Langshans. (White. Black.)
  - Faverolles.

**Light Brahmas** are an old breed of oriental origin, greatly improved in America, upstanding, the largest of the chicken family, weighing eight to twelve pounds; are hardy, fair layers, persistent sitters, splendid meat producers, plumage white with black markings, and feather-shanked.

**Dark Brahmas** are like the foregoing but darker in color, with partridge markings, and of slightly less weight.

**Cochins** are shorter-legged than the Brahmas, with broad, low-set bodies, very fluffy feathers, extending down the shanks, quiet

disposition and strong aptitude to fatten. In weight they range from seven to ten pounds.

**Langshans** are a very upstanding breed, with prominent tails and long necks. They are white-skinned and prolific layers, with some feathers on shanks, and weigh from six to ten pounds.

**Faverolles** are a French breed, produced by crossing the English and Asiatic upon French stock. They are of various colors, partridge, black, white, red, and salmon, the latter being more common. The comb is single and they have a beard.

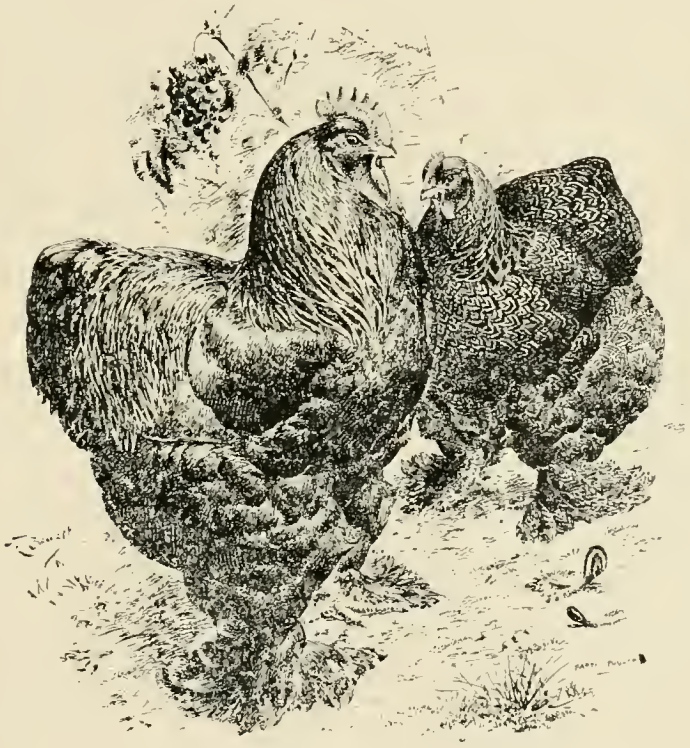
Section II. The general purpose fowl comprises mainly the American group and includes the following:

- General Purpose Breeds
  - American
    - Plymouth Rocks
      - Barred.
      - White.
      - Buff.
      - Partridge.
      - Columbian.
      - Silver-penciled.
    - Wyandottes
      - Silver-laced.
      - Silver-penciled.
      - Golden-laced
      - White.
      - Buff.
      - Partridge.
      - Columbian.
      - Black.
    - Javas
      - Black.
      - Mottled.
    - Dominiques.
    - Rhode Island Reds
      - Single Comb
      - Rose Comb
    - Buckeyes.
  - French
    - Houdans.
  - English
    - Dorkings
      - White.
      - Silver Gray.
      - Colored.
    - Orpingtons
      - Buff.
      - White.
      - Black
      - Jubilee.
  - Oriental Games
    - Indian
      - Cornish.
      - White.

**Barred Plymouth Rocks** originated in New England more than

half a century ago from a cross of the Java and Dominique. They are characterized by bars of different alternate shades of a slaty blue color on the feathers. The comb is single, skin yellow, and the shanks without feathers. The breast is long and full, the body erect and well fleshed. The standard weight is from six to nine pounds. They are esteemed for egg production, dressed poultry, hardiness and exhibition fowls. No breed is more popular in America than the "Barred Rocks."

**White Plymouth Rocks** are probably a sport from the barred variety, similar in all respects and slightly less in weight.



PARTRIDGE COCHINS

**Buff Plymouth Rocks**, while probably very slightly related to the foregoing, have come to resemble the type and possess the buff color.

**Silver Penciled, Partridge and Columbian Plymouth Rocks** are, in breeding, shape and color, like the Wyandottes of those varieties, but differ from Wyandottes in having single combs. While sports of the Wyandotte family, they have heads like Plymouth Rocks, and are being bred to the latter type.

**Silver Wyandottes** were the original breed of the Wyandotte family, having been produced by crossing the Hamburg, Dark

Brahma and Cochins, about forty years ago. The Wyandottes are a rose-combed, smooth-shanked, yellow-skinned family, rather low set and more compact than the Plymouth Rocks, and about a pound less standard weight, i. e., five to eight pounds. The characteristic color is black, with diamond shaped white markings on the feathers, giving a spangled or "laced" effect.

**Golden Wyandottes** originated in a similar line of breeding, slightly after the Silver variety, and are like them in all respects save that a rich golden bay takes the place of the white color on the feathers.

**White Wyandottes** are a sport of the Silver variety, perhaps fortified by crosses of the best large white breeds. They are true type Wyandottes, of a pure white color, and one of the most popular breeds in America.

**Partridge Wyandottes** have the shape and characteristics of the breed, with partridge color markings, like their Dark Brahma or Partridge Cochin ancestors.

**Silver Penciled Wyandottes** are marked like the Partridge, but with silver in place of golden brown color.

**Buff Wyandottes** have all the family traits and conformation and are of rich buff color.

**Columbian Wyandottes** originated in a cross of the White Wyandottes with nearly smooth-shanked light Brahmas. They have been brought to true Wyandotte type with the beautiful markings of Light Brahmas.

**Black Wyandottes** are colored as name indicates.

Several minor varieties of Wyandottes are bred in a small way, viz.: the Buff Laced; Violet, having buff feathers edged with violet blue; and the Cuckoo, with the color of the Plymouth Rock.

**Javas,** although an old breed, having been a factor in the production of the Plymouth Rock, have been much modified by later breeders. They are now a very useful egg producing breed, low set, long bodied, large sized,—about midway between the Plymouth Rock and the Langshan. They have single combs, red earlobes and yellow skins.

**Mottled Javas,** produced by crossing the Black Java on the White Plymouth Rock, have beautiful plumage of black and white.

**Dominiques** are an old breed, characterized by blue barred or "cuckoo" feathers. They may have sprung from a Hamburg cross

on the old white and black fowls of America. They were early esteemed with the Javas for egg production and meat. They have the rose comb and shape of the Hamburg, but are double the size. They are shorter-legged and otherwise different from the Plymouth Rock.

**Rhode Island Reds** are a New England breed, recently recognized, of mixed origin, resembling somewhat the Plymouth Rock in general shape, though rather smaller, with a differently shaped back and tail. Two sub-varieties are the Rose Comb and the Single Comb. The plumage is a rich red, shading to black. They are prolific layers and good utility fowls.

**Buckeyes** originated in Ohio, in a cross of Asiatic and Game stock, with possibly other elements. They have yellow skins, pea combs, and red plumage. In size they are like the Rhode Island Reds, and in shape like the Indian Games. They are esteemed for egg production and as a table fowl.

All of the foregoing American breeds have yellow skins, smooth shanks and red ear lobes, and lay brown eggs.

**Houdans** are the most popular of the French breeds found in America. They are a medium sized, general purpose breed, having black plumage tipped with white. They have a large crest and beard, like the Polish breeds, and need protection from wet. They lay white eggs and are less hardy than the American varieties.

**Crevercoeur** are similar to the Houdan, weighing from five to eight pounds, and have glossy, black plumage.

**La Fleche** is another French breed, smaller and more on the Mediterranean order, having the V, or antler, comb and black plumage.

**Dorkings** are perhaps the oldest breed of fowls known to poultry literature and are credited to English breeders, probably having their origin in Roman stock. Dorkings are characterized by five toes,—one more than ordinary fowls,—and very long, low set, compact bodies, and are greatly esteemed for table poultry. The skin is white and the flesh pinkish white.

The White Dorking has a rose comb, while the Silver Gray and Colored varieties have single combs.

**Orpingtons** originated in England from crossing the Buff Cochins and Hamburgs on the Dorkings. They are large sized, com-

pactly built, general purpose fowls, somewhat on the Cochin type.

They have become very popular both in England and America. They are white skinned and pink fleshed, like all English breeds, and lay tinted eggs. The present varieties are Buff, White, Black and Jubilee, or Spangled, with both single and rose comb sections in each. Ear lobes should be red.

**Indian Games,** with the Sumatra Malay and Aziel, form the class of Oriental Games. The Indian is a made breed, credited to English breeders. They are very heavy breasted, meaty fowls, with hard, close plumage. They are less pugnacious than the Pit games, and more useful, though they are less hardy and prolific than our American sorts.

The varieties are the White and the Cornish, the latter being beautifully pencilled, somewhat like the Partridge.

Sec. III. **Leghorns** were originally introduced to America from Italy. The brown variety came first, about 1835, the white appeared in the early fifties, and the black and buff later on. Leghorns are of small size when compared with the meat and general purpose fowls, very plump breasted, with yellow legs and skin and white ear lobes. The plumage is close, and the comb, wattles and tail feathers conspicuously developed. They mature early and are remarkably prolific layers of large white eggs.

**White Leghorns** are, perhaps, the most numerous and popular of all the varieties of the family, the single comb section largely outnumbering the rose comb section. The latter was probably produced by a Hamburg cross.

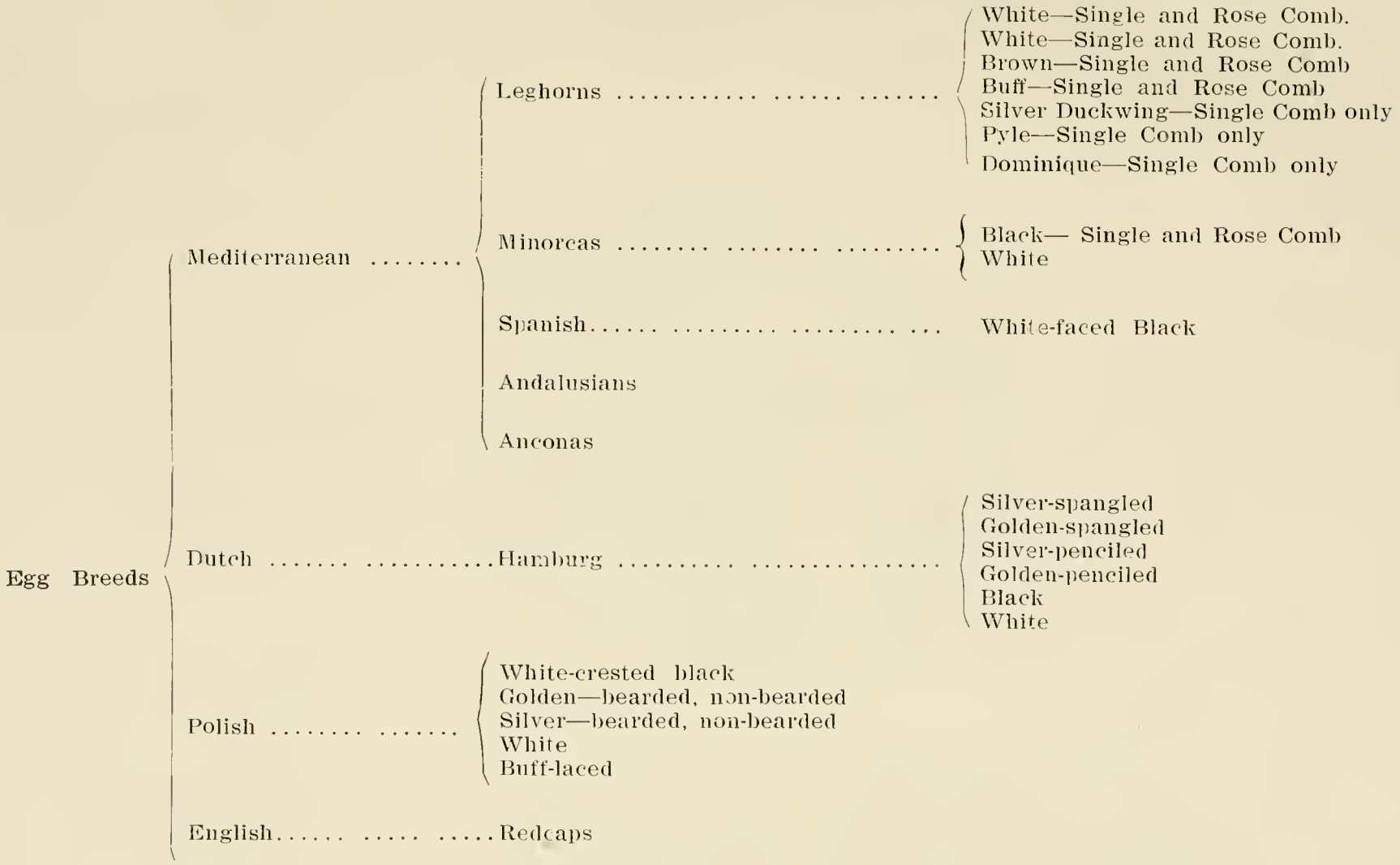
**Brown Leghorns** are also very popular and attractive, with red and black plumage and sprightly carriage.

**Buff Leghorns,** like the white and brown, have both rose and single comb sections, and came direct from Italy.

**Black Leghorns** have plumage colored as the name indicates, but with yellow skin and legs.

**Silver Duckwing Leghorns** are shaped like the brown variety, but have white markings in place of the red of the latter.

**Pyle Leghorns** are white, with red hackle, breasts and wings. They can be produced almost at will by crossing the brown and white varieties.


Egg Breeds
Mediterranean
Leghorns
White—Single and Rose Comb.
White—Single and Rose Comb.
Brown—Single and Rose Comb
Buff—Single and Rose Comb
Silver Duckwing—Single Comb only
Pyle—Single Comb only
Dominique—Single Comb only
Minorcas
Black— Single and Rose Comb
White
Spanish
White-faced Black
Andalusians
Anconas
Dutch
Hamburg
Silver-spangled
Golden-spangled
Silver-penciled
Golden-penciled
Black
White
Polish
White-crested black
Golden—bearded, non-bearded
Silver—bearded, non-bearded
White
Buff-laced
English
Redcaps

**Dominique Leghorns** are cuckoo colored, like the old American Dominique or the Barred Plymouth Rock.

**Minorcas** originated on an island of that name, off the coast of Spain. They may have a common origin with the Spanish and differ from the Leghorns in having a white skin and dark colored shanks, and are larger in size. The Minorcas are the largest of the Mediterranean breeds, are less active and produce fewer eggs than the Leghorns. The varieties are Black and White, each with single and rose comb sections, the latter said to be sports from the former.

BLACK MINORCAS

**Black Spanish** is a breed of unusual length of body, leg and shank, giving them a stilt-like appearance. They are large in size and, though formerly hardy, the fanciers' passion for immense white earlobes, covering part of the head and extending below the wattles, has reduced the hardiness and utility of the family.

**Andalusians** are of a slaty or lead-blue color and between the Leghorn and Minorca in size. The breed is widely known, but has no history other than that the blue color has always resulted from crossing blacks and whites of the same breed.

**Anconas** are an Italian breed, allied to the Leghorns, mottled black and white in color, with yellow legs.

All of the foregoing Mediterranean breeds are active, hard feathered, egg breeds, less inclined to broodiness than the heavier fowls.

**Polish** breeds resemble the Leghorns in shape and size, have a small V-shaped comb and are characterized by enormous crests of feathers growing from a rounded knob on top of the head. They are prized by fanciers but are not important among the utility breeds. They are not particularly hardy. The varieties are White-Crested Black, bearded and non-bearded, White, bearded and non-bearded, Silver, bearded and non-bearded, Golden, bearded and non-bearded, and Buff Laced.

**Red Caps** are an old English breed on the order of the Hamburgs, with heavier bodies, approaching the Dorking, to suit English tastes in poultry. In color they are rich brown, shading to red and black, with crescent shaped marking of glossy black.

Sec. IV. **Ornamental Breeds** include the Games and Bantams.

**Games** are among the oldest breeds of fowls. They have gradually been evolved from the Pit to the Exhibition type, and have a very limited economic value. The present type is characterized by a very erect stilted station, wherein the eye is directly over the hock joint. The plumage is so hard and close as to reveal the body lines more clearly than any other class of poultry.

Eight well defined varieties are known in America, viz:

Black Breasted Red.
Brown Red.
Golden Duckwing.
Silver Duckwing.
Birchen, like Brown Red, with white instead of yellow markings.
Red Pyle.
Black.
White.

**Bantams,** or dwarfs, are now bred in imitation of many of the standard breeds of fowls, by using small sized females.

**Asiatic Bantams** include toy specimens of Light and Dark Brahma; White, Buff, Black, Partridge and Cuckoo Cochins; Boot-

ed Bantams, with much feather on the shanks, particularly at the hock.

**Seabright Bantams** are among the most attractive and popular of the Bantams and are of Golden and Silver varieties, on the Hamburg order. They are characterized by the stylish carriage of head, tail, and wings, the beautiful and sharply contrasted color markings and the "hen tails" of the cock birds.

**Japanese Bantams**, Black, White and Black-Tailed White are very short-legged and attractive.

**Polish Bantams** are diminutive likenesses of Polish standard breeds.

**Game Bantams** of all standard Game breeds are to be found, often exaggerating the Game type.

**Other Bantams** are Sultans, Silkies, Frizzles, Rumpless, Nankin, Scotch Gray, Langshan, and now even the Plymouth Rocks, Wyandottes and other American breeds are represented by Bantam imitations.

## CHAPTER II.

## MODERN INCUBATION AND BROODING.

By ARTHUR A. BRIGHAM

**I. The Egg.** Enclosed within its firm, symmetrical shell, the egg contains the hope of success in poultry production.

We think of the hen's egg commonly as composed simply of "yolk" and "white" and "shell."

We consider eggs of importance because they are a staple article of food, very acceptable to most people as a means of satisfying hunger and nourishing the human body.

Business men think of eggs as an article of commerce, and invest large sums in what is termed the "egg trade."

To the poultry breeder the most important thing in relation to the egg is the little round whitish spot, about one-eighth of an inch in diameter, which is located near the middle of the upper surface of the yolk. This is the real "egg" and contains the "germ-cell," which, under favorable conditions of incubation, will develop into a living chick.

It is impossible to determine by the appearance of this spot whether the egg is fertile or unfertile. If the female egg or germ has not been fertilized, or impregnated, it is termed sterile. In this case the spot appears whitish all over, or has only occasional flecks here and there upon its surface. If the egg is fertile the spot shows usually a dark center with a whitish ring about it. It is within the dark central portion that the impregnated germ-cell is situated.

Sometimes this "life-cell" begins to divide and form cells while yet within the body of the hen, before the egg is "laid." This division and multiplication of cells is the beginning of the development of the embryo chick in the process of incubation. After the egg is laid and cools, the process of development halts until the conditions of incubation again surround the egg and its "germ spot," after the egg has been placed under a broody hen or in an incubator.

It is necessary to break open the shell of an egg to determine its fertility or sterility, and after a fertile egg is broken it is useless for the purpose of hatching. There is a practical advantage, how-

ever, in being able to determine whether or not the eggs of a breeding flock are running fertile. If we are using eggs from hens for the table, we can, a few days before we expect to begin incubating, examine the eggs which are served for breakfast. If many of these eggs fail to show fertilized germ cells we must ascertain the cause of sterility and correct the condition. A change of the male bird may be necessary, or mistakes in feeding and management may require correction.

## Incubation Insurance.

So much depends upon good eggs, and so many influences are liable to affect the incubating quality of the eggs, that we may well consider carefully some of the points which directly and indirectly affect the eggs.

**Points in Breeding.**—The production of an egg is a breeding act. The poultryman cannot neglect the foundation facts of breeding and expect to get good eggs for hatching. Good constitution, vigor and health in the breeding birds are essential conditions. By "good constitution" is meant a normal, well grown, mature body, containing a strong heart to pump the blood through the circulatory system; ample lungs and breathing power to take in the air with its life-giving oxygen and to carry out the carbon-dioxid; good digestion, to take the food and extract from it the nutrients for renewing the blood, repairing and building up the body parts, and making poultry products; strong bones and muscles, and steady nerves, all abounding with the vigor of life and never weakened by disease. This point cannot be too strongly stated, because oftentimes the poultry fancier, in his eager striving to secure beautiful plumage, or other fancy points, forgets to consider constitution and health. Frequently, also, the "utility poultryman," in his ambitious efforts to secure large egg yields, allows abuse of the breeding powers, and weakness or impotence may follow. If a flock of a fine laying strain of fowls is induced to begin producing eggs in early autumn and to continue laying through the winter, the eggs produced in spring, especially if the birds are confined, are very likely to be lacking in qualities which insure successful hatching and brooding.

Using eggs for hatching from pullets, instead of from mature hens, usually results in a reduction of the percentage of chicks

hatched and raised. An excellent plan is to use the eggs of the first season's laying for the table or for market, keeping a laying record of the individual selected pullets, and then the next season using for hatching the eggs laid by the birds which come nearest to meeting the requirements of your standard of excellence.

**Points in Feeding and Care.**—The hatching quality of the eggs is certainly affected by the foods and feeding.

Indian corn is one of the best grain foods for poultry, but if fed exclusively or to excess it is liable to induce the storage of internal fat, until the intestines, heart, etc., become coated with thick layers of fatty tissue and the liver becomes congested. This process may go on until fatty degeneration takes place in the ovary, where the eggs are started, and the ovules become globules of fat, losing their function of reproduction.

The daily rations of the breeding fowls should include grains, green food, meat, or animal food of some kind, and mineral matter, in order to furnish the right proportions of the nutrients necessary for keeping up the heat of the body, repairing wastes, building new tissues, and making eggs.

**A Daily Ration.**—A balanced daily ration for twenty-five laying hens, averaging four pounds each, for dry feeding in the winter time, may include 3 lbs. Indian corn, 2 lbs. wheat, 1 lb. beef scraps (50% protein), and 1 lb. clover hay.

The corn and wheat furnish chiefly starchy nutrients for keeping up the heat of the bird's body. Other grains may be used. The beef scraps furnish the main supply of protein nutrients which go to make muscle, nerves, albumen (the "white of the egg"), etc. Meat scraps, fresh cut bone, milk curds, etc., may take the place of commercial beef scraps in the ration. Alfalfa may readily replace the clover, and is even more desirable. Alfalfa leaves are especially rich in protein nutrients. Clover or alfalfa hay makes an excellent winter substitute for the green grass or fresh growing grain of summer.

Grit must be supplied in order that the laying hens may have grinding stones in their gizzards—"grist mills." Granulated bone answers this purpose well, and at the same time supplements the supply of mineral nutrients for repairing and building up the bones of the fowls. Egg shells or oyster shells, crushed to eatable size,

will supply material for the shells of the eggs. Condiments, such as cayenne pepper, mustard, ginger, etc., and condimental "poultry foods" sold at stores should not be fed to fowls. Fresh, pure water must always be at hand for drinking. Very serious trouble may result if the fowls drink at barn yard pools, sink drains and like filthy places.

Ample straw or hay litter in the hen house should be provided and renewed frequently. Some of the small grain used in feeding may be scattered in the litter to induce the hens to exercise. Eggs from fowls which scratch or range for a portion of their daily food, usually hatch far better than eggs from a flock of lazy fowls.

The poultryman should see that no external parasites, such as mites, are drawing on the life blood of the breeders. Spraying the perches and interior walls of the laying house with 2% carbolic acid solution will tend to keep these insect pests at a distance.

**Collecting and Keeping the Eggs.**—It does not pay to be careless about the eggs during the period between laying and incubating. The sooner the fertile eggs start the hatching process the better. Eggs lose in hatching quality by age. After one week the older the eggs become, the poorer the chances of hatching.

More than one novice in poultry keeping, after reading a fascinating incubator catalogue, and investing his good money in a "perfect hatcher" has thought that he could take store eggs or anything in shells and hatch therefrom at least 100% of fine chicks. An embryo poultryman, thoroughly inoculated with the incubator idea, often exhibits some of the symptoms of incipient insanity. The results of the hatch, in case old eggs are used, even in a good hatching machine, are likely to bring the young poultry keeper a return of reason.

The sooner good, fertile eggs are collected after laying, the surer the chick crop. Every practicable precaution should be taken to prevent filth and dirt from coming in contact with the eggs in the nests, because bacteria or germs, which may work harm to the egg life within the shell, are brought to the egg in this way. Eggs for hatching should be kept clean, rather than be allowed to become soiled and then cleaned by washing. Clean nests and frequent renewal of the nesting material, dry floors with litter upon them, water fountains that will not leak or slop over, well drained yards

and the prevention of muddy conditions will help insure clean eggs.

Fertile eggs will stand considerable cold, but should not be allowed to remain in a freezing temperature.

There is also danger, when some of the fowls become broody in the laying nests, of the fresh laid eggs being left too long under the hens, allowing incubation to get too far along to be stopped with safety to the embryo life beginning to develop within the egg.

If the eggs must be kept for some days before incubating begins, place them where the air is pure, and the temperature not above 60° F. A moist, stagnant cellar atmosphere is not favorable to good keeping. There should be no foul odors in the room, arising from decaying vegetables. The room should be ventilated, but there should not be strong drafts of air moving over the eggs to cause evaporation of their liquid contents. If eggs for hatching are purchased, the size of the air cell in the large end of each egg is a good index of its age. A fresh egg has a very small air cell, not larger than a dime, but as time goes by the contents of the egg lose some of the water and the air cell increases proportionally in size.

When eggs are purchased from a distance and transported by rail or otherwise, they are very liable to suffer by jolting and jarring, which, if excessive, may rupture the inner lining or "'soft shell" of the egg and ruin the chances of hatching.

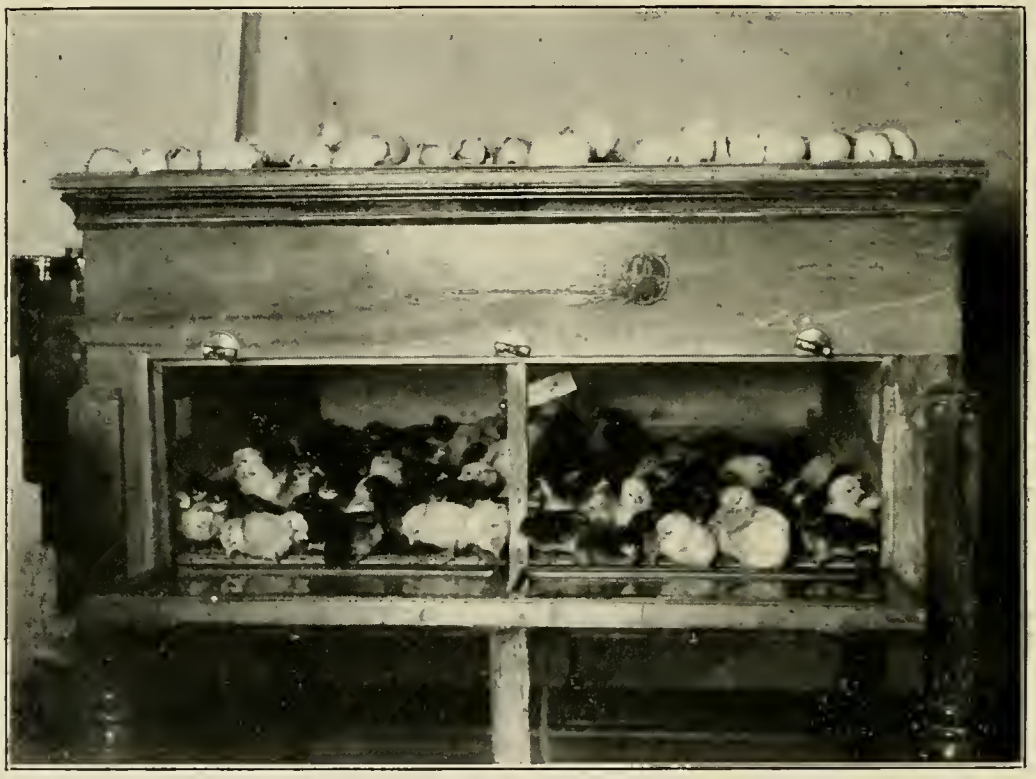
## INCUBATION.

Shall we hatch the eggs by means of broody hens or by machines? Systematic tests of the natural and artificial methods of incubating lately conducted by James Dryden at the Experiment Station of the Oregon Agricultural College have brought the following "Conclusions:"

They show that the hens are more efficient hatchers than the incubators, though the incubators hatched a fairly satisfactory number of the eggs. It may be true in practice that the incubator will hatch as many chicks, on the average, as the sitting hen, because the hen sometimes breaks eggs in the nest and sometimes quits her job, two things that the incubator is not guilty of; though occasionally the lamp will go out, the temperature will go wrong and all the eggs will be spoiled. But this is a matter of care with the

operator and with fair care the loss from accident will be less in the incubators than under hens. It may therefore be that an incubator properly attended, will, on the average, hatch as many chicks from a certain number of eggs as a certain number of hens will hatch from the same number of eggs of the same kind.

Successful incubation, however, does not mean merely the hatching of a large percentage or a certain percentage of the eggs; the serious problem is not how to hatch the greatest percentage of the eggs, but it is rather how to hatch the largest number of chicks of greatest vitality. The test of the incubator is not that it hatch-



A GOOD HATCH

es, on the average, as large a precentage of the eggs as the sitting hen, but that it hatch as many and as good chicks as a good sitting hen. Until this can be done poultry enterprises will continue to lag where artificial methods of incubation are used.

On the whole, the results show that artificial incubation is responsible for the large percentage of chicks "dead in the shell," as well as for the large mortality of chicks in the brooder. There are doubtless brooder problems affecting the vitality of the chick, but

this fact should not obscure the plain demerits of artificial incubation."

## NATURAL HATCHING.

I recall two cases of striking success in following the natural plan of hatching chicks.

In one instance a farmer's wife hatches yearly from two hundred to three hundred chickens by means of sitting hens. She sets under each hen an average of fifteen eggs and gets an average of thirteen chicks per sitting. She makes a good profit by the sale of fresh eggs and plump chickens at ordinary prices.

In the other instance a poultryman near a great city keeps a thousand hens in one house and hatches many hundreds of chicks annually by means of sitting hens but cares for the little chickens in brooders heated by hot water.

In both of these cases the persons are interested in their work, painstaking in the care of fowls, and successful in securing excellent results. The safe and sane way for the amateur in poultry keeping is to begin on a small scale and use the natural plan of hatching.

Nature is very successful in her methods. Her habits are not experiments and her systems have worked out through long experience.

"But," some will say, "the hen frequently fails to bring out good hatches." Yes, but her failures may almost always be traced to some condition caused by human interference with nature's plan. Mistakes may have been made years back in the breeding of the parent stock, or the feeding may not conduce to fertile eggs or the development of strong embryos. Worst of all, perhaps the sitting hen may be afflicted by parasites. Many broody hens have stuck to their task of incubation when a multitude of "mites" were sucking the life blood out of them. Some have been faithful even unto death but that has not saved the young lives within the eggs. Ignorance of the presence or of the terrible destructive power of these "bedbugs" of the feathered family has caused more partial and total failures than anyone realizes.

## SETTING THE SITTERS BY SYSTEM.

The simple requirements of success in natural hatching are

known by hundreds and thousands of poultry keepers. Women usually make the best managers of the sitting hens because they give them the necessary care.

It is not well to have the hens scattered here and there because of the dangers from rats and other enemies.

It is possible to secure all the advantages of the "stolen nest" and yet have the sitters under control. A room or house should be set aside for the exclusive use of the sitting hens during the hatching season. The shelter should be either new or thoroughly cleaned. Careful complete spraying of the interior with a 2 per cent solution of carbolic acid will destroy the mites and disease germs if they are within reach. Fresh garden soil or sandy loam makes an ideal floor.

Nests may be hollowed in the soil, a little chaff added to line the nests, and then empty orange boxes inverted and placed over the natural nests. The front of each nest box should have a door which may be kept closed when necessary. Many nests may thus be made on the ground even in a small room. More nests may be made by placing the boxes in tiers. These elevated nests may have bottoms of moist mellow loam and be lined with chaff or cut straw.

A galvanized bucket makes a good water holder and should be filled afresh every day. Another bucket on a box will hold the supply of whole corn which is the best feed for sitting hens.

A dust bath of fine mellow soil should be provided in the brightest part of the room. If there are windows for lighting the room these should be shaded so that the interior will be somewhat darkened.

Sometime before hens are brought to their sitting quarters they should be well dusted to destroy the body lice. Holding a fowl by the legs in an empty barrel the fine dry dust is sifted by the fingers amongst the fluffy feathers and worked in clear to the skin.

Hens that show decided broodiness are taken after dusk, carefully carried to the new nests, placed thereon and shut within. Burlap sacking thrown over the fronts of the nests will make them darker and more secluded and may be kept there for a day or two. China nest eggs are conductive to continued broodiness in the new quarters. The nest fronts are opened towards evening and the hens invited to come out for food, etc. Any hens that stay on the nests

may be given the chance to come off the next morning. If they do not come out they should be quietly taken off the nests and given opportunity to feed, drink, and dust. All that go back to nests may be considered ready to receive their sittings of eggs.

The eggs should be selected from the best breeding stock, as fresh as possible, regular in size and shape, having shells uniform in texture, not mottled, thin, hard, "metallic" or ridged.

## STARTING BY SQUADS.

A number of hens should, if convenient, be set at one time. They should come off daily and at a regular time of the day when it is easiest for the poultryman to see that they all go back to their nests.

The eggs should be examined by means of an egg-tester after five to seven days of incubation. Any infertile eggs and all that fail to show live embryos should be removed. The clear "infertiles" may be used in the household and the eggs containing dead embryos may be saved to use later for chick food.

The "live eggs" are returned to the sitters and, if all of the hens are not needed to cover the tested eggs, the extra ones may be given fresh eggs to incubate or may be persuaded to give up incubating and prepare for laying.

Dusting the hens with Pyrethrum or lice powder at the end of the first and second weeks will help prevent the presence of body lice.

If, during the incubating period, the air is very dry, water may be poured into the soil under the nests. The moisture evaporating will keep the atmosphere surrounding the eggs in a sufficiently humid condition and prevent too rapid "drying out" of the contents of the eggs.

It is not usually well to wash the eggs but if by accident they become smeared with the contents of a broken egg or by filth they should be cleaned. Just before hatching time it is allowable to wet the shells of the eggs with tepid water.

Let the mother hen manage the "coming out" of her chicks.

Do not feed the little chicks for two or three days but allow them chick grit and water.

## THE MACHINE HATCHER.

After the poultryman has become experienced in hatching by

the natural method he may find it desirable to utilize machines for incubating.

The artificial hatchers, some of them at least, will successfully deliver the chicks in large numbers and at seasons when they may be wanted for early broilers. These incubators become "broody" at command and they will do the hatching while the hens keep on producing the eggs.

## OPERATING THE INCUBATOR.

Directions accompany each machine and there are about fifty different makes of incubators in America.

Three conditions are important in incubation:

1. The temperature at the level of the tops of the eggs on the trays should, in Montana, be kept at about 102 degrees and not above 103 degrees the first seven days. It should not go above 103 degrees the second week and had better not go higher the third week until hatching time when it may rise to 105 or 106 degrees F.

2. The ventilation should not be excessive the first ten days, while the embryo is developing its parts, but it should be sufficient to supply abundant air, carrying the oxygen needed by the circulating blood during the second half of the period of incubation. It is during this latter time that the parts of the chick body increase in size by growth. As seen before the egg-tester the air-cell of the egg should increase in size only slightly for the first ten days. After that it should increase rapidly until at the nineteenth day it occupies about one-fifth of the interior space of the egg.

3. In Montana the moisture conditions need careful consideration. The moisture of the air in the egg chamber should be ample the first ten days so that no water shall be drawn by evaporation directly out of the albumen of the egg through the pores of the shell. Every particle of moisture in the egg should do its work of dissolving food and carrying it in the blood to build up the body of the chick before it is allowed to escape through the shell.

During the second ten days of embryo life in the shell, there is a wonderful amount of work being done by the red blood flowing through the multitude of blood vessels, if the conditions of warmth, air and moisture are correct.

If the chicks come out promptly on the twentieth day it is safe to conclude that the temperature has averaged about right. They

should surely be hatched by the end of the twenty-first day. During hatching the air in the egg chamber should not be so dry as to cause the inner lining of the egg shell to become tough. Wet sponges or pans of wet sand or water safely placed, may be used, if necessary to supply moisture to the air and thus keep these linings soft, in which condition they are easily torn by the chick struggling to get out of its prison.

Fine strong chicks are sometimes made cripples if escape from the shells is long delayed.

Irregular hatching often results from failure to change the position of the eggs on the trays. When the eggs are turned daily the trays should be reversed in position and the eggs should be moved about considerably to secure average conditions, especially of temperature.

Continual study of the problems of incubation, while doing the best we can in practice, will secure for us a better and better understanding of the essential conditions. Skill comes by experience, insuring success.

## BROODING THE CHICKS.

Nature's way of brooding chickens is very good. Lively, lusty, well hatched chicks are easily managed. If entrusted to the mother hen in mild weather the poultryman may feel fairly confident that the youngsters will be well cared for. A good sitting hen will remain upon her nest until the chicks are all hatched and most of them a day old. She may be given whole corn and a drink of water to help keep her contented. It is best not to feed the chicks and especially desirable not to stuff them with food the first two or three days.

If the hen and her brood can be given the freedom of the premises the conditions will be almost ideal. They should have a shelter in which to stay at night and should not be let out early in the morning if liable to wander in wet grass. If the range for the flocks must be restricted they may be kept in a fenced yard which should include both tillage and grass land. An apple or plum orchard is an excellent place for the growing chickens in summer. Fresh, pure drinking water should always be at hand.

If the mother hen must be confined in a coop she should have

at least a small yard annexed, which may be covered with wire netting. If there is danger of cats or other enemies catching the chicks they may be confined to runs covered with one-inch-mesh wire poultry netting. The coops and yards may be changed to fresh ground twice a week.

In many localities there is danger because of large rats which seem to delight in murdering little chicks. One of these vicious rodents will sometimes destroy a whole brood of chicks in a night. They catch their victims behind the head or behind the wings, thrusting their sharp teeth through the spinal cord and causing instant death. To prevent the deadly work of the rats the coop may have a board floor or be placed on wire netting and the front of the coop safely protected by netting or screening at night. Ventilator openings may also be covered with wire netting.

The saving of the chicks from death by enemies and accidents depends largely upon the care and caution exercised by the poultryman or poultry-woman.

After the hens have weaned their flocks the chickens may be separated according to sex and kept in colonies of fifty or more, in small houses provided with perches, and scattered on free range.

## ARTIFICIAL BROODING.

Machine mothers cannot "cluck" and the poultry-keeper has to provide the watchful care which protects the little orphans from dangers. They can be kept in brooders without artificial heat but great care is necessary and not more than twenty-five chicks should be kept in one "heatless hover." If very few chicks are placed in such a brooder they may suffer because the hover is supposed to be warmed by the animal heat of the live chicks. Their body heat is kept up by using the food they consume. The brooder must be well protected from the weather if to be used when the outer temperature is low. The hover is made small and covered with warm woolen pads or other protective material to keep the heat in and imitate the conditions provided by the mother hen, as nearly as possible.

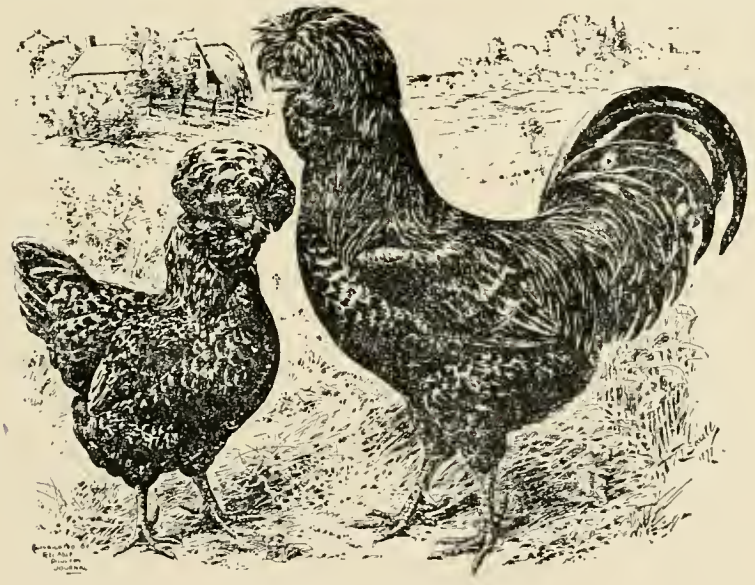
Brooders having hovers heated by lamps are used very extensively. The best plan seems to be to heat mainly by means of a hot water reservoir and to supply warmed fresh air for breathing directly and continuously to the chicks in the hover. Brooders, whether heated or unheated, can readily be operated out of doors in

mild weather but even "out-door" brooders had better be run indoors during the cold season, especially if storms of wind, snow, and rain are liable to occur. Both the poultry raiser and his chickens will be more comfortable if the brooders are under sheltering roofs. The conditions should be such as to induce the chicks to stay out of the hovers except when they wish to run in and warm up in the daytime or to rest during the night.

Let the exercising place outside the hover be as bright and attractive as possible. Provide chaff or cut straw for litter on two or three inches depth of sandy loam. Scatter small grain in the litter to encourage the chicks to "scratch for their living."

## HOVERLESS BROODERS.

It is commonly considered necessary that little chicks should have a hover in which to "cuddle," yet the most comfortable and



HOUDANS

contented lot of chicks that I have ever seen was brooded in an open room without a hover. There were several hundred chicks in the flock and yet no signs of crowding together or "piling up." The reason for this happy condition of affairs was very evident. It was in cold weather but the room was kept just warm enough by steam heat. The chicks when they were resting did not huddle together but "squatted" separately upon the litter, "hovered" by the comfortable temperature of the surrounding atmosphere.

## FEEDING THE CHICKS.

Dry feeding is safest. Fresh, pure water for drinking should be provided in fountains placed on blocks or against the side of the brooder so that no litter or filth can be scratched into them. Hoppers for holding feeds may also be hung at the sides of the brooder or coop. These may have separate compartments for grain such as wheat, oatmeal, cracked corn, bran, etc., and for granulated beef scraps and cut clover or alfalfa hay, or meal, if before the season of growing grass. Granulated bone, gravel or coarse sand will supply grit for the gizzards and granulated charcoal (of wood or bone) may be kept at hand. The chicks soon learn to balance their own rations if they have all the food materials at hand, in hoppers. The latter may be made of thin boards or of galvanized iron.

By taking the food in dry form the digestive system is enabled to add to its gastric and other digestive juices, the gizzard mixes and grinds all together to a pulp, the processes of digestion and assimilation proceed in the natural way and disorders of the liver and other organs are avoided.

The feed stuffs should be wholesome and palatable, never musty, fermented, or decayed.

## A BALANCED RATION FOR CHICKS.

To show the proportions of a properly balanced ration for growing chicks the following is given:

Cracked corn ..... 3 lbs.
Wheat ..... 3 lbs.
Beef scraps (50% protein) ..... 2 lbs.
Cut clover hay ..... 2 lbs.

This is sufficient daily ration for two hundred chicks, six to eight weeks old in cold weather.

The ten pounds of feed include six pounds of grain, two pounds of animal food and two pounds of dried "green" food. Oatmeal, millet, etc., may replace the corn or wheat without disturbing the balance to any great degree. These or other grains also add variety to the rations. Hard boiled eggs, chopped, shells and all, into bits, may replace the beef scraps, or dry milk curds may be used to furnish protein. Alfalfa hay may replace the clover in the winter

time. Fresh lettuce leaves, sprouted grain, or chopped onions may also be used as "green food."

## CLEANLINESS.

If the hovers or quarters of the chicks are allowed to become foul or filthy the conditions invite the presence of parasites (lice, mites, intestinal worms, tape worms, etc.) and the development of disease germs. Cleanliness will usually prevent these "scourges." Sunshine and fresh air help the chicks to keep healthy and happy. "Chicken troubles" are very difficult to remedy. It is more profitable to prevent them.

## CHAPTER III.

## STUDIES IN INCUBATION IN MONTANA.

By EDMUND BURKE

The artificial incubation of chicks in this state has been less successful than in other states. For this reason studies of both natural and artificial incubation have been conducted during the past four years by the Chemical Department of this Station, the work being still continued.

Natural incubation has been studied for the purpose of securing data upon three important factors in incubation, namely:—1, daily temperature during incubation; 2, the daily percentages of water vapor; and 3, the percentages of carbon dioxide in the air surrounding the eggs.

These three factors are each of more or less importance in the proper growth and development of the embryo chicks.

Studies in artificial incubation were intended first to determine the conditions existing in incubators as they are usually run, and secondly to reproduce in an incubator the conditions found in natural incubation.

The water vapor and the carbon dioxide have been supplied to the incubator so that the analyses of air taken from the egg chamber correspond very closely to the analyses of air surrounding the eggs in natural incubation. The temperatures, however, are not so easily made to correspond to the temperatures observed in natural incubation. When natural conditions are more closely reproduced in artificial incubators, it seems probable that there will be a smaller percentage of eggs tested out of machines during incubation, and that the percentage hatched and the vitality of the chicks will be greatly increased. This may appear over sanguine before it has been proven, but our work with an electrobator this season, (1909), lends support to the opinion.

With incubators, as they are generally run, the three factors before mentioned will not coincide exactly with natural incubation, but if the directions which follow are observed, good hatches and chicks of good vitality may be expected.

**The Incubator:**—Where a constant current can be had an in-

cubator heated by electricity is safest and gives the best results. Where the use of electricity is impracticable any standard make of incubator with a large lamp will give good results, provided it is properly cared for.

The incubator should be placed in a well ventilated room where drafts of air will not strike it, and the room kept at as uniform a temperature as possible. The machine should be properly leveled, and if it has been used before, it should be well cleaned or even fumigated before the eggs are put in. For cleaning the incubator, Graham, of the Ontario Agricultural College, recommends the use of a 10 per cent solution of zenoleum, a disinfectant sold by all druggists. Instead of using the zenoleum, formaldehyde and potassium permanganate may be used by taking 1 lb. of formaldehyde to 7½ lbs. of permanganate. This is sufficient to fumigate 1,000 cubic feet. The permanganate should be put in a can or pan and the formaldehyde poured in, and at once placed in the incubator. The incubator should be kept closed for four or five hours. At the end of this time the ventilators may be opened, and the lamp started. Usually by the time the machine is regulated the formaldehyde will have escaped sufficiently to permit putting in the eggs. If by the time the proper temperature has been secured the odor of formaldehyde is strong, it is better to wait until you get but a faint odor before placing the eggs in the machine.

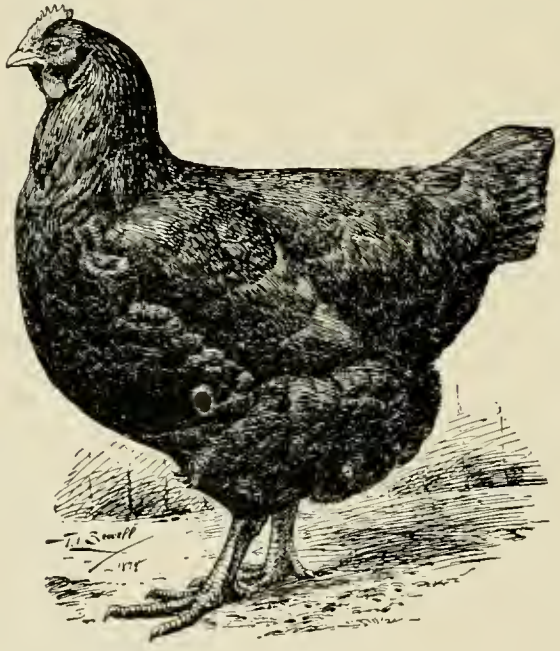
**Selection of Eggs:** Eggs should be selected from fowls which are properly cared for, and the fertility should be known to be good, for without fertility and strong germs, the hatch will not be satisfactory.

It often happens that eggs from different breeds are put together in the incubator. This should be avoided when possible, and especially is this true if the eggs are not of uniform size. This is apparent when we know that during the earlier stage of incubation the embryo chick is always found floating on the upper part of the egg, a point that should be kept at the right temperature. The temperature varies at different elevations in the incubator, being warmest at the top and coldest at the bottom. Therefore, the embryo chick in a large egg would be maintained at a higher temperature than an embryo in a small egg.

**Testing of Eggs:** Eggs should be tested out twice during incubation. The first test should be made on or about the seventh

day, and the second on the fourteenth day of incubation. The egg tester can be put on any lamp using a No. 2 chimney, or where electric lights are available, an eight or sixteen candle power bulb may be used in the tester. This latter scheme has been condemned by some, but there seems to no danger of injuring the embryo if the eggs are removed from the tester in a reasonable length of time.

**MOISTURE:** In high altitudes there is no doubt as to the value of moisture added to an incubator. For this purpose two shallow pans made of galvanized iron so that they will cover the bottom, are filled with sand and placed in the incubator. The sand should be kept wet throughout the incubation period, and should not be removed until the chicks have to be let down below the egg trays.



BLACK JAVA HEN

By this means, the humidity of the air surrounding the eggs will range from 50 to 62.5, which is too low rather than too high.

There are different ways by which moisture can be added, but the one just described is probably the best now in use. Some companies furnish sand trays with their machines, but in case this is not done, the trays can be easily made by any tinner, and are quite inexpensive.

**Temperature:** The temperature at which incubation should be carried on is still a problem for investigation, and much work

is being done. Cycleshymer, of the St. Louis University, has made a careful study of temperatures throughout the natural incubation process and by running incubators at the same temperature has obtained very satisfactory hatches. He says "One certainly does not widely err in stating that the most favorable temperature within the egg chamber is close to 102 to 103 degrees F., the first half of the incubating period, and 103 to 104 degrees F. for the latter half."

In the above work the temperature in the egg chamber was determined by a thermometer placed flat, and on a level with the top of the eggs, but not in contact with them. Our work on the temperature of eggs during incubation showed that there is but a slight increase in the temperature of the top of the egg throughout the incubating period, but we do find an increase in the temperature of the whole egg, from the beginning to the end of the hatch, caused by the growth and metabolism of the embryo chicks. As stated before, the embryo, during the early stage of incubation, is always found floating in the upper part of the egg, and it is this particular part that should receive a definite temperature, for the development of the embryo is dependent upon the heat that it receives, either from the hen or from the incubator.

For this state it would be well to keep the temperature of the top of the eggs in an incubator as near 102 degrees F. as possible throughout the incubation period or until the eggs begin to pip. At this time the temperature should be raised to 104 or 105 degrees F. and even as high as 106 degrees F. for a short time seems to promote the hatch.

In starting the incubator select a thermometer that has been accurately tested and place it on the egg tray in such a manner that the center of the bulb is on a level with the top of the eggs. Thermometers that are placed either above or below this point should not be used, especially if the incubator is to be run at the temperature above given.

**Turning the Eggs:** The usual method is to turn the eggs twice each day, morning and evening, by removing some of the eggs from the center of the tray to give room to turn the balance. The flat of the hands are placed upon the eggs and they are moved toward the center with a rolling motion. After turning all the eggs in this manner, the eggs which were removed are again placed in the tray,

when they are either ready to be put in the incubator or allowed to cool.

When the eggs are turned it is better to remove both trays and when they are again put into the machine not only the tray but the ends should be reversed. By this method any unequal distribution of heat in the incubator will be offset by a change of position.

**Cooling the Eggs:** Each morning or evening after the eggs have been turned, they should be allowed to cool until the temperature falls to about 85 degrees F. when they should be again put in the incubator. After the eighteenth day the eggs should not be removed from the incubator and the machine should be kept closed until the hatch is well advanced, when it should be opened for the shortest time possible to remove the sand trays to give the chicks room below the egg trays.

**Care of the Lamp:** It is always best to use the highest grade of coal oil in the lamp, and the wick should be trimmed every day. Otherwise there is danger of smoky flames.

**Ventilation:** The ventilation of incubators is a matter of much importance. The prevailing idea is to give plenty of fresh air to the embryo chicks and in no case allow the air to become foul from gases given off by them.

From our experience with natural and artificial incubation, we find that incubators, with ventilators closed, contain air with less carbon dioxide than is found in natural incubation, and as a matter of fact our best hatches and chicks with the strongest vitality have come from incubators which were poorly ventilated.

In incubators well ventilated the carbon dioxide usually ranges from 8 to 40 parts per 10,000 by weight, depending on the period of incubation, while in natural incubation the carbon dioxide ranges from 13 to 100 parts per 10,000 by weight, depending on the period of incubation and the compactness of the material of which the nest is made.

In one incubator the carbon dioxide ranged from 10 to 176 parts per 10,000 by weight with an increase from the beginning to the end of the hatch. In this experiment, while the chicks were hatching the carbon dioxide rose to over 200 parts per 10,000 without producing any ill effects. 85 per cent of the eggs hatched and at the end of three weeks not one had died.

This case is cited simply to show that incubators may be run with but little ventilation, and if carbon dioxide does aid in weakening the shell and increasing assimilation of lime, too much ventilation will tend to prevent these changes, and cause poor hatches and weak chicks.

The ventilators, however, may be opened some 12 hours after the chicks begin to hatch, for the purpose of causing a circulation of air to dry the chicks.

## CHAPTER IV.

## PRINCIPLES OF BREEDING.

By F. S. COOLEY

Poultry breeding in its fundamental principles is the same and obeys the same natural laws that apply to breeding in general, whether in plants or animals. These laws have come to be better understood since the time of Bakewell (1750), through his efforts and studies, and those of subsequent breeders and physiologists; but are by no means thoroughly comprehended even by the best authorities at the present time.

As an art, breeding was skillfully practiced in ancient times by the Romans, Bedouins, Egyptians and Medes; and the patriarch Jacob, thirty-five centuries ago, is credited with having produced at will cattle that were "ring-streaked and speckled and grisled" from the original brown breeds by means of peeled rods.

More attention has been paid to breeding the larger animals and more progress has been made in their improvement than with domestic fowls. Breeding the latter has been largely haphazard and only a few breeders have paid particular attention to selection and mating in a progressive way and with a definite purpose.

English poultry breeders have given more attention to breeding for utility and productiveness, caring less for color than have their American cousins. American breeders have, on the other hand, bred and selected with particular reference to feather and color, often overlooking the shape and useful qualities of the birds in their zeal for fancy points.

A wrong system prevails among the general run of poultry breeders both on farms and with specialists. In the first place they confine selection to male birds only—sometimes not even selecting superior males. On the hen side no selection is attempted. As a consequence the eggs used for hatching chicks to replenish the flock are laid by the less productive hens. This fact is easily demonstrated. Eggs for hatching are incubated during April and May to a large extent. These are about the only months that the poorer layers are at work. The early layers and profitable hens have begun to go broody or are resting from a prolific winter laying season. As

a result the great proportion of eggs laid during the hatching season comes from the poorer layers.

The effect of this system, or lack of system, in selection and breeding is that the good influence of the male for improved usefulness is neutralized by the qualities of the female, and the result is a failure to improve or else an actual retrogression.

If a well selected cock were penned with a few of the early laying prolific hens, the effect of such selection for a few successive generations would be a family or strain characterized by prolific layers and profit makers.

Again, a farmer with a large flock of hens buys a half dozen male birds and turns them loose with the entire flock, getting an average ordinary male influence and a low female influence (as previously noted) on the entire egg product, from which he hatches his chicks.

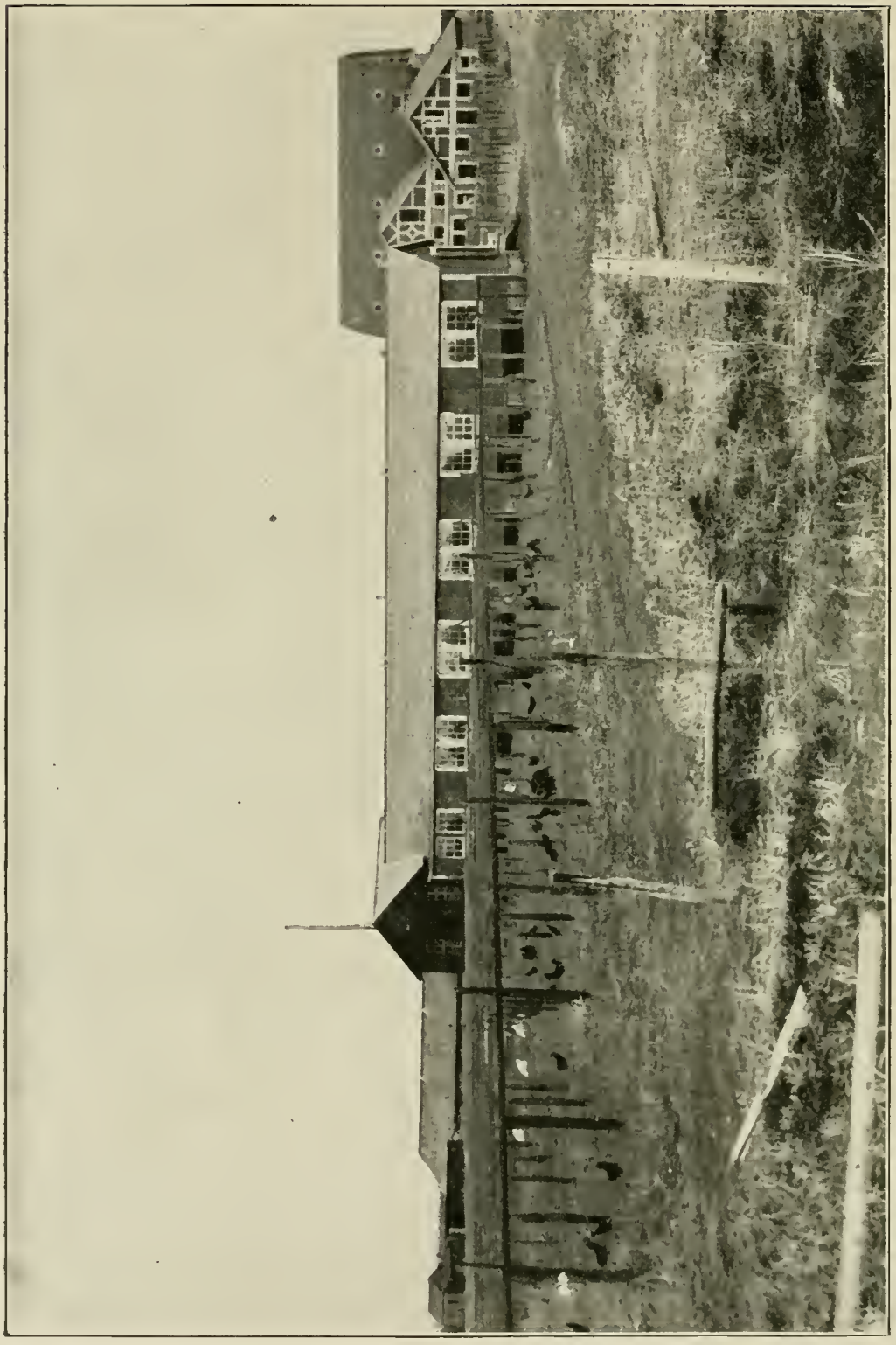
If he would take half the price of his six males and buy one of marked superiority and then select a pen of his finest early laying hens of uniform appearance, his eggs for hatching from this pen would represent the cream of the flock instead of its average or poorest end.

The possibilities for improvement are immense. The value of one superior prepotent male is incalculable. The effect of saving eggs for hatching from a few of the best hens tends to enhance rather than to destroy the value of a high class male.

## ADVANTAGE OF PURE BRED POULTRY.

It is so easy and relatively so inexpensive to keep good pure bred chickens that there is little excuse for the scrub stock so commonly found on American farms. From a single setting of eggs or a trio of breeding birds a whole flock of pure bred stock may be produced in two or three seasons at a nominal cost.

It would be worth the cost for advertising purposes alone. The farm with a uniform and well selected flock of pure bred chickens at once places the stamp of interest and progress and intelligence on its manager. The value of all his products is enhanced because it is seen that he knows and strives to produce a good thing. His credit at the bank is improved. The value of his property is increased and his interest and good management in other details of the business is reflected in the character of his chickens.



EXPERIMENT STATION POULTRY PLANT AT BOZEMAN, MONTANA

On the other hand, a scrubby lot of fowls of mixed colors and sizes and shapes betokens a careless breeder and a careless farmer, one who is not thorough in his work or in his management and the value of whose crops is reduced by reason of careless methods in their production.

While it is well to see the color of a man's hair before drawing final conclusions in regard to his character, the kind of chickens he keeps is a criterion, nevertheless.

## HEREDITY.

This may be defined as the transmission of powers, qualities, and characteristics from parents to offspring. The law is tersely expressed in the aphorism **like begets like.**

The principal of heredity is the corner stone of animal breeding. Without it there would be no point to the selection of the best specimens for reproduction, for without the assurance that the features of excellence would be transmitted there would be no advantage in incurring the trouble and expense of securing breeding stock of superior merit. The entire practice of selection of choice breeding animals is based on the certain expectation that their good qualities will be reproduced in their progeny.

Heredity affects many different phases of life and for convenience of discussion we will divide the subject into four parts; viz.,

Heredity of normal characters of the race,

Heredity of acquired characters and individual peculiarities,

Heredity of abnormal characters,

Heredity of defects and diseases.

**Normal Heredity** includes the size and external shape of the body; the character and color of body covering and appendages, such as horns, beards, spurs, comb, etc.; the functional activities of digestive organs and organs of respiration, circulation, and reproduction; and the nervous system, temperament, mental qualities, habits, and disposition.

The fox, for example, begets offspring that everywhere and under all circumstances may be recognized as belonging to that species. The size, color, form, functions, mental traits, and even the voice are unmistakable and have been the same throughout countless generations during the period of human history. The same

principal of normal heredity controls the generation of all plant and animal life.

**Heredity of Acquired Characters and Individual Peculiarities.** Individual deviations from the normal or average qualities of the breed are often reproduced in the progeny of such individuals until, after a few generations, they become fixed family traits. Such characters may be in degree or in kind.

For example, physical strength or quickness may be normal to a species and yet belong to certain individuals in a marked degree. Some families in the human race have produced a large number of athletes, wrestlers, runners, boxers, foot ball or base ball players. Some strains of horses have developed extreme trotting speed, others inclined to pace, or run. The draft families are characterized by massive strength and the saddle breed by varied gaits.

Degree of function is exemplified in the immense milking powers of some of the Holstein-Friesian cattle, and the butter product of Jerseys and Guernseys, or in the fleshing propensities of Shorthorn, Hereford and Angus cattle, and particularly some improved breeds of swine.

The degree of the reproductive function varies in different families. Some are shy breeders, others exceedingly prolific. The selection of fowls for egg production from stock known to be prolific layers is amply justified by experience and observation in the compelling force of heredity to transmit such characters to the progeny. If you want prolific layers breed from stock possessing that quality in an intensified degree.

Individual characters and peculiarities are observed to reappear in the progeny. In the human family the tendency to early baldness is transmitted from father to son, as is the color of the hair, and its early becoming gray. Poor teeth and defective eyesight, e. g. color-blindness, are inherited. The tone of the voice and qualities of speech and the musical ear will be found to be peculiar to certain families.

Advantage may be taken of such individual characters to breed up a strain or family of high value, because it possesses uniformly the character transmitted from the ancestor in question.

**Heredity of Abnormal Characters.** Habits or characters at variance with those normal to the race may be considered abnormal. Thus cattle without horns have been bred from a race in which horns

were almost unexceptional. Bobtailed cats have sprung from a species uniformly possessing tails. One-eared rabbits have been evolved from the normal, bilaterally symmetrical, ancestral type, and, conversely, double or branched organs from a family in which these exist singly. . .

The families of five-toed fowls, (Dorkings), of six-toed cats and of humans with a supernumerary finger or toe may be cited as examples of abnormal variations.

Such variations, contrary to the normal characters of the race, are not reproduced with any regularity. Hereditary tendencies are rather against than in line with their reproduction. They may appear in a certain small proportion of the offspring. If these are kept to perpetuate the species and, particularly, if mated with others posessing the same tendency, actual or potential, the character becomes intensified with each succeeding generation until at length it reaches the point of a family trait that is normally transmitted.

**Heredity of Defects and Diseases.** Undesirable qualities are transmitted as well as good ones. In the human family the tendency towards tuberculosis, insanity, and other irregularities of form and function has come to be universally recognized. In horses ophthalmia (blindness), defects in respiration, diseases of the bones and joints are avoided by breeders, who consider their transmission to offspring likely. The value of horses possessing such defects is low, from a breeder's point of view, because of the probability of their producing progeny with the same defects.

The same rule operating in all animal breeding applies to poultry. Diseased and defective parents transmit those qualities to progeny, reducing their value and perhaps bringing all kinds of trouble into the flock.

Diseased and defective birds should be carefully discarded from breeding pens and only the most vigorous and perfect specimens retained to replenish the flock.

**Dominant and Latent Characters.** Dominant characters are those which are conspicuously present in individuals during life. In them we find abundant manifestations of the laws of heredity. There are other characters of parents which pass unnoticed in their progeny. These may remain latent for a generation or perhaps for many generations. They may have been forgotten entirely and make their appearance unexpectedly after the knowledge of their

source has been lost. This latter class of characters is termed latent.

There are variations in the intensity of dominant characters and in their relative conspicuousness. Dominant characters of one generation may lapse and become latent in subsequent ones; while latent qualities may become predominant after a season of disappearance.

Sex may relegate dominant characters to the background for a generation, e. g., a dairy bred sire without the milking function developed in himself, yet inherits the potential quality which he transmits to his female progeny in a high degree.

**Atavism.** The appearance in the progeny of characters not present in the parents and perhaps unobserved in the ancestry for several generations, but yet belonging to some ancestor, is called atavism. The word comes from the Latin *atavius* meaning ancestor. It is called "reversion" or "breeding back" or "throwing back" in the parlance of animal breeders.

There has been a school of naturalists which sought to disprove the Darwinian hypothesis of evolution on the assumption that all changes and mutations in forms of life were but the rearrangement of inherited characters of various ancestors in new proportions,—like a kaleidoscope with the same lights and prisms producing a continually new effect, owing to different arrangements.

The appearance of horns on the progeny of polled cattle, the reproduction of colors of remote ancestors different from those of the parents, and, especially when breeds are crossed, the tendency to throw back to the ancestral type from which both breeds were originally derived, exemplify atavic inheritance.

This is very noticeable in crossbreeding races of fowls or pigeons which may have been bred pure for many generations. It has been affirmed by pigeon fanciers that crossing two distinct varieties without a blue spot on either has a strong tendency to produce the blue color in the wild species from which domestic pigeons have sprung. In the same way crossing breeds of chickens is likely to restore the dark colors of the jungle fowl, the parent stock from which the chickens have arisen

**Correlation.** A relationship exists between all the parts and organs of each animal. The modification or change or abnormal development of one organ or member has its influence upon other

parts of the same organism. Sometimes the increased acuteness of the sense of smell is accompanied by less acute sense of sight. The greyhound hunts by sight and does not run an unseen quarry, while the blood hound or fox hound will run past its quarry in plain sight by following its sense of smell. The loss of hearing often makes people see more acutely, and the loss of sight is followed by a quickening of hearing and smell.

There is a correlation between function and external shape, which enables the keen observer to note the degree of functional activity (in itself undiscernable) by details of external form. Close

ROSE COMB RHODE ISLAND RED

joints and fine bones indicate fleshing properties. The wedge shaped body, long head, neck, and body suggest dairy excellence. A mellow skin accompanies good circulation and nutrition, with active digestion.

Sex characters are very pronounced. Generally a glance at the head will enable the observer to distinguish the sex of any mature animal. Among cattle the horns not only distinguish the bulls from the cows, but they distinguish the castrated male or the "free martin" heifer from either. Among deer which shed the horns, this is peculiar to the male sex. The females have no horns. The loss of the male function is said to be clearly manifested in the de-

velopment of the horns, for castration at various stages of their development has an almost immediate effect. Castration when the horns are shed is said to stop their growth, when partly grown to arrest their development, and when in the velvet to prevent shedding.

So in domestic fowls, the head indicates the degree of activity of the reproductive function. The cock bird with large comb, wattles, spurs, and sickle feathers has all the virility of the best of his sex. A small comb and hen tail betoken impotency. A red comb in the hen denotes active egg production. The capon with pale color or slight development of comb is incapable of reproduction.

**Variations.** The law of eternal variation in all living forms is just as inflexible and constant in its operations as that of heredity. While heredity will control the majority of characters in transmission, their transmission *in toto* is an ideal conception which is never reached. No two animals are exactly alike. Study critically the traits and features of the most similar specimens among a thousand birds of the same breed, and differences will multiply until the sense of likeness becomes lost. The first impression of uniformity disappears upon intimate study. Children of the same parents differ widely in size, features, color and mental qualities. No two leaves in all the millions in yonder forest are exactly alike.

Variations may be morphological (pertaining to form), substantive (pertaining to quality), meristic, (number and arrangement of parts), or functional (degree and nature of activities of organs). Examples of these may be cited as follows:

One horse is larger than another,—a morphological variation. Of two horses alike in form and size one can pull a heavier load, or trot faster because of stronger muscles or greater nervous energy—a substantive variation. Two flowers of the same variety may have different numbers of petals or two cattle different numbers of horns—a meristic variation. One cow gives a greater quantity of milk than another, or two produce milk of very different quality—a functional variation.

There is, further, a mutation or progress of variation that applies to the average of a breed or species and is entirely apart from the individual differences from the general average. Hens may be gradually improving in egg production; cows in average milking quality; horses in average strength or speed; or [illegible]d in average

culture and intelligence. These would be progressive mutations.

Variation is of vast importance to the breeder, for if the offspring was like the parents in all respects there would be an end to improvement. By taking advantage of variations upward and eliminating variations downward we may gradually increase the value and usefulness of almost any class of animals.

**Variations due to Inherent and External Causes.** There will be considerable differences among animals begot by the same parents and brought up under identical conditions as regards food, climate and environment. Such variations may be considered inherent in the organism and predetermined from birth. These are largely beyond the control of the breeder.

Among the external causes tending to produce divergence of type, may be noted climate, food, environment and use.

**Climate.** Temperature influences the development and functional activities of fowls. Cold checks growth, postpones or prevents propagation, and induces an increased body covering. A congenial temperature stimulates growth and reproduction.

Damp climates gradually change the character of birds to meet their exigencies. A general effect of wet is to increase the skin covering. This is exemplified in the fur of animals of the arctic regions.

**Food.** Abundance of nutritive material causes increased growth and development and stimulates propagation to consume nature's surplus. The opposite condition—hunger—prevents growth and dimishes reproduction. Food and climate are closely associated, for the production of vegetable life and its food supply is contingent upon favorable climatic conditions.

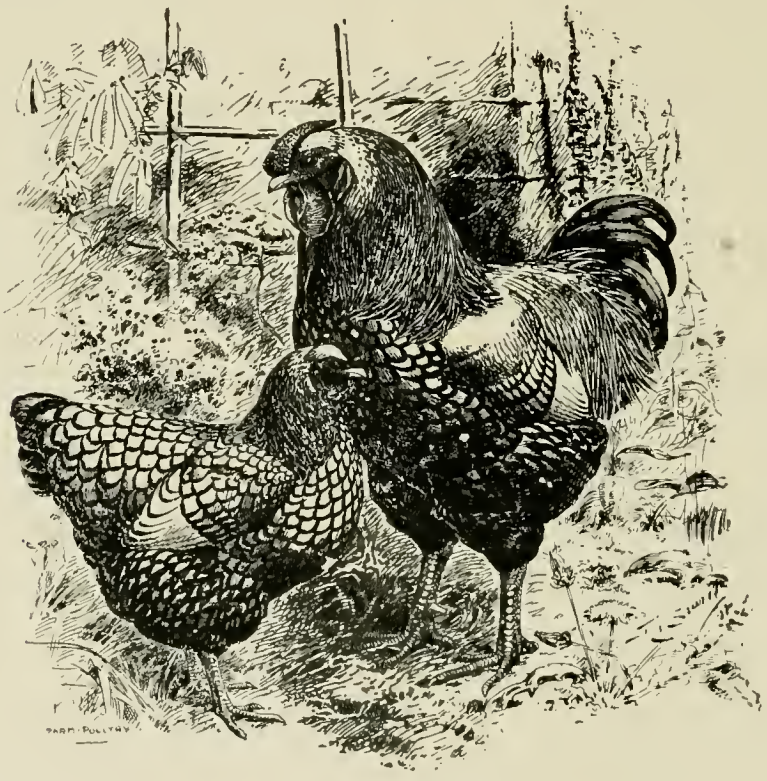
**Environment.** Other factors than climate may be considered among the external surroundings of fowls. High altitudes cause increased chest development. Arctic snows tend to light colors. Coloration to bring animals into harmony with surroundings and thus afford protection is one of the beneficial provisions of nature to preserve life.

Birds in harmony with their environment thrive and produce freely while uncomformity in this regard saps vitality and takes energy from channels of normal production to sustain the battle of life.

**Use or Exercise of Function.** The normal use of any member or organ tends to strengthen and build it up. The athlete goes into

training and not only obtains better control of his muscles, but actually improves their quality and increases their substance. Actual tests have demonstrated that the leg bone of the domestic duck withstands a far greater breaking strain than that of his wild cousin. On the other hand, the wing bone of the wild duck is far stronger than that of the same breed in domestication. Habitual use of the right arm and hand has the effect to make them larger and stronger than the left.

Among our domestic animals marked modifications have resulted from the selection and use by man for various specific purpos-



SILVER WYANDOTTES

es. The examples of various breeds of horses for different uses; the fleshing properties or the milking propensities among cattle; the different grades and kinds of wool on sheep; the fat production of the hog; the size, shape, hair and the psychic qualities of the dog; the great variety of pigeons; and the high degree of perfection in various breeds of chickens, all go to show that the use or exercise of certain functions has an important influence on the characters of the breed.

While normal use strengthens and develops, excessive use may injure and weaken an organ or member. Egg production may be gradually increased but over production may cause reaction and devitalize the birds. Use of digestive organs increases their capacity; overloading may result in delicacy and weakness.

The importance of bodily exercise should be borne in mind wherever a heavy tax is laid on the system. Close confinement of fowls and heavy feeding is incompatible with prolonged egg production or general usefulness. By compelling fowls to exercise, scratching for grain in litter, jumping for grain in the sheaf, or suspended vegetables, health and tone may be secured that enable them to produce heavily without injury.

**SPORTS.** A sudden and spontaneous variation from the ancestral type for which no explanation can be found in heredity or environment is called a sport. A white crow, blackbird or other albino illustrates the subject. Marked deviations of form or supernumerary members, extra fingers, toes, or limbs are regarded as sports.

It is sometimes possible by close inbreeding to fix the characters manifested in the sport and form a new breed in which they become uniform; but as a rule such unusual features are seldom reproduced.

**Cross Breeding.** One of the most potent causes of variation is cross breeding. Purebreds transmit uniformly most breed characters. Nature's purebreds, the fox, the bison, the robin, the partridge—are very uniform. Domestic animals are not nearly so fixed in type nor so pure in blood as are the native wild species. Nearly all domestic animals have been subject to more or less promiscuous cross breeding. As a result variations are far more common than in wild species. Animals of mixed breeding, having no uniformity of inheritance, cannot be expected to transmit uniform qualities. In proportion to the uniformity in the ancestry we reasonably expect uniformity in the progeny.

Cross breeding has a tendency to break up fixity of type. An interesting example is found in the history of the dahlia. This is a native Mexican plant of no great beauty in its wild state. Many years ago it was brought to France and cultivated in the botanical gardens of Paris. Efforts to produce varieties failed. It was a pure breed in a very tenacious sense and reproduced as uniformly as other purebreds do. At length another variety of dahlia was

found in another part of Mexico and taken to Paris. The two pure breeds were crossed and the persistent uniformity of transmission broken up. Having broken up the true type by crossing, that marvelous and endless variety of forms was begun for which the dahlia has since become famous.

In breeding fowls crossing has been very extensively practiced. In consequence almost every conceivable form and type and color has been produced. To fix and establish the types desired is the difficulty. Today the tendency to vary and transmit mixed characters is the greatest obstacle to the production of a uniform flock of birds. Cross breeding is the cause of the difficulty.

Cross breeding is said to invigorate a decadent family by introducing fresh blood and increased virility. The increased vitality may increase size and fecundity at the same time in the opinion of many authorities. Cross breeding is not nature's method, however, either in plants or animals, and nature's testimony is that the pure breeds and races have not deteriorated, nor become sterile during the thousands of years that have elapsed since man first knew them as they exist today.

**Grades and Grading.** A grade is an animal of pure breeding on one side of its parentage only. It should possess a majority or preponderance of the blood of some pure breed. Generally the progeny of pure bred males from grade or mixed bred females is meant by the word grade. When males of some pure breed have been used for several successive generations the influence of that breed becomes paramount and the qualities are to all intents and purposes identical with those of the pure breed. After three or four top crosses of a pure breed the other blood factors become so small that they diminish by almost insensible gradations. Purity of blood can never actually be reached by grading up, yet grades may equal for useful purposes the pure bloods . Pure bred animals have generally come to be such by empirical decree of man rather than by fact, for practically all are of mixed lineage a few decades back. Pedigrees of pure blood going back more than a century are very exceptional.

For breeding purposes grades are considered less likely to transmit uniformly than pure stock, because the latter inherits greater uniformity of characters.

**Pure Breds.** Animals having the blood of one breed only with no admixture of that of other varieties are termed pure bred or full

blooded. The term thoroughbred is sometimes erroneously used to denote purity of blood. In its correct usage Thoroughbred is the name of a distinct breed of horses, and its use otherwise betokens ignorance or carelessness on the part of the user.

Poultry breeders can and should keep to pure bred stock of one or more standard varieties. Cattle or horse breeders or breeders of other domestic animals may have neither the means nor ability to successfully breed pure. There are too few pure breds to meet the needs of all and as has been said, except for producing sires, grades answer the same purpose.

Pure bred sires are always preferred because their inheritance of uniform characters enables them to transmit these with greater certainty. Inheritance of uniform mediocrity, as is the case with some registered stock, does not entitle any male animal to consideration for breeding purposes, nor does pure blood furnish adequate excuse for the use of an inferior individual as a sire.

**Prepotency.** It is often observed in mating animals that the progeny much more closely resemble one parent than the other. We say the one exerting the preponderance of influence is the more prepotent. Occasional individuals like the stallions Messenger, Eclipse, and Electioneer, stamp their characters indelibly upon more than a single generation of descendents.

A prepotent male, from his multiplied opportunities in procreation, exerts an important influence in the improvement of a herd or flock. The proverb current among breeders, "The cock is half the flock," may express only a small fraction of the real signification of the influence of a really prepotent male.

Such a sire has a value well nigh incalculable. Often this is not realized until he has passed from his sphere of usefulness. A potent factor in creating prepotency is the multiplication of ancestral units possessing the characteristics so prepotently transmitted. The selection and mating of individuals possessing specific qualities generation after generation intensifies those qualities and creates a prepotency to fix them in the progeny. This is often accomplished by inbreeding or mating close relatives.

**In-Breeding.** The mating of relatives within certain limits of consanguinity is termed in-breeding. Some divergence of opinion exists in regard to the degree of relationship where inbreeding stops. ny relationship nearer than first cousin may be included.

In the production of the best breeds of poultry and live stock it has commonly happened that the finest specimens were closely related. Breeding from the best therefore often involved inbreeding; mating close relatives possessing a desirable character in common serves to intensify that character in the progeny.

Inbreeding has been one of the most potent factors in fixing breed types. No force has been equally available and effective in breaking up the tendency to variation induced by cross breeding.

It is thought that inbreeding has a refining tendency accompanied often by a propensity for fattening; that it reduces size and vigor and diminishes the fecundity of stock so bred. It is further urged that it often transmits diseases and defects to progeny of related parents.

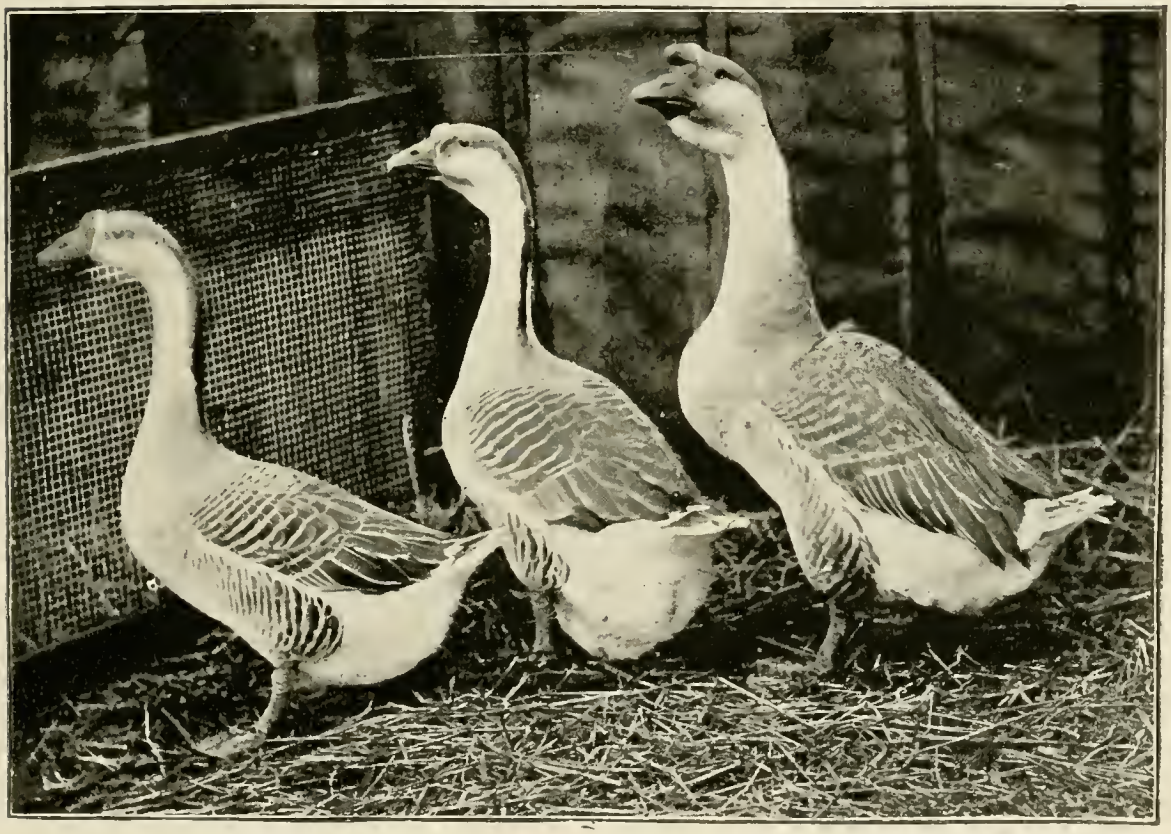
Evidence does not show that inbreeding introduces qualities in the progeny which were absent in the parents. On the other hand it intensifies the characters present in both parents. If, therefore, the parents have only desirable qualities and have these in common, their offspring are likely to inherit these in an intensified degree. If on the contrary, both related parents have a common disease or defect they fix that on the offspring to a serious extent. I would not hesitate to breed a superior prepotent male to his own daughters unless he had some fault that would menace the health and value of his progeny. On the contrary, a male may be so valuable that a double portion of his influence is the greatest factor for improvement of his stock which the owner can have.

A modified type of breeding differing from inbreeding only in degree and persistence is line breeding. Some of the most useful and famous families of domesticated animals have come from line breeding.

Edwin Hammond's strain of Merino sheep; the Duchess family of Shorthorns bred by Thos. Bates; and I. K. Felch's Essex strain of Barred Rock fowls may be cited as examples of line breeding. It is virtually breeding within a family for many successive generations.

**Determination of Sex.** Perhaps no generation has passed without some fakir having advertised an infallible rule for producing males or females at will. Interesting results have been noted in some instances, which were interpreted as supporting one or another of these theories, as for example, the sex of the offspring is more like-

ly to be that of the older parent or the parent having the preponderance of vigor. The degree of impregnation has been thought to influence sex, i. e., where one male is mated with an excessive number of females the majority of the progeny will be females but where males are many and females few there will be more males among the offspring. Another notion has been that the male germ was produced in the right generative organs and the female germ in the left. The degree of nutrition of the embryo has been considered influential by some physiologists; the female resulting from the higher and the male from the lower state of nutrition.



CHINESE GEESE

These and many other theories have been advanced for the control of sex. We may not here discuss these in detail but observe that sex is no nearer being controlled by breeders than in the beginning.

## SELECTION.

The essence of sucessful breeding, and improvement of living

organisms, is selection. An old English authority says, "He will prove the most successful breeder who can select with the most correct judgment." A celebrated breeder of greyhounds famed for swiftness, in reply to a query regarding the secret of his success, said, "I breed many and hang many." The late Edwin Hammond, who was perhaps the greatest breeder of Merino sheep, was asked what proportion of his rams he considered good enough to use in his own flock. He replied, "Not one in three hundred." Yet he was selling many to other breeders for hundreds and even thousands of dollars each.

Probably the greater part of the genius of Luther Burbank lies in his almost intuitive powers of selecting those plants nearest to his ideals. He has been said to save only two or three plants and consign hundreds of thousands to the brush heap.

So in poultry breeding selection is all important. No poultry keeper can expect to be highly successful who fails to apply the principles of selection to his breeding operations. Selection must in the first place take cognizance of adaptation. Fowls must be adapted to their surroundings or environment, suited to the purpose for which they are kept, and of a sort that the breeder likes and admires. He will be more successful with his favorite breed than with one he does not like.

For Montana in general the hardier breeds are likely to prove most satisfactory. The "Rocks," Wyandottes, Orpingtons, or kindred types will find the widest adaptation to purpose and conditions. This does not preclude the keeping of less hardy varieties by one who strongly prefers them; he will merely have to make conditions a little more favorable. The Mediterranean or Asiatic classes will doubtless succeed well where the poultryman understands them.

Individual excellence is of more consequence than breed. One should carefully choose his best birds for reproduction and this is especially true of the cock. The breeding should include only the most perfect specimens available, typical of the breed, vigorous, free from defects, and especially good breeders. Shy breeders and sexually deficient birds are undesirable.

Uniformity is another important consideration in selection. The breeder should have his ideal type clearly fixed in mind and breed closely to that ideal. Miscellaneous characters seriously mar

the value of a flock, particularly where the sale of breeding stock is a feature of the business.

Prepotency should be carefully sought and turned to account. A prepotent male gives the breeder a splendid impetus towards his standard of perfection. Mutual adaptability is another desirable factor in selection. No birds are exactly on the ideal order. Deviation in one direction should be corrected by matings with those on the other side of the median line. Select males that are strong where females are weak. Be careful not to intensify defects by matings where the defect is common to both sexes. Nicking is to be sought. The breeder who can select males and females that nick well together, correcting each other's faults and producing progeny superior to parents, is a genius indeed.

The elimination of weeds and scrubby specimens needs constant attention. The breeder who says he has no weeds is one to avoid. Eternal vigilance is the price of success and only by its means can the breeder secure the best and avoid the undesirable specimens in his line.

## CHAPTER V.

## DOUBLE MATING AND BREEDING SHOW BIRDS.

By D. J. LAMBERT, Poultry Dept. R. I. State College, Kingston, R. I.

Double mating is so called because two matings are used for each breed (one for each sex) in order to produce each sex as nearly perfect in shape and color as possible.

The terms often used, cockerel and pullet matings, may confuse the novice and cause him to think that cockerel matings are designed to produce a majority of males and pullet mating more females, while the fact is that this method of mating has nothing to do with influencing the sexes as to their number, but only with the design of securing each sex as near the Standard models as possible.

This double mating system is practiced by nearly all breeders of Standard poultry and can be used to advantage with white or solid colored fowls to bring out the most desirable shape and with all parti-colored breeds to control the color of their offspring.

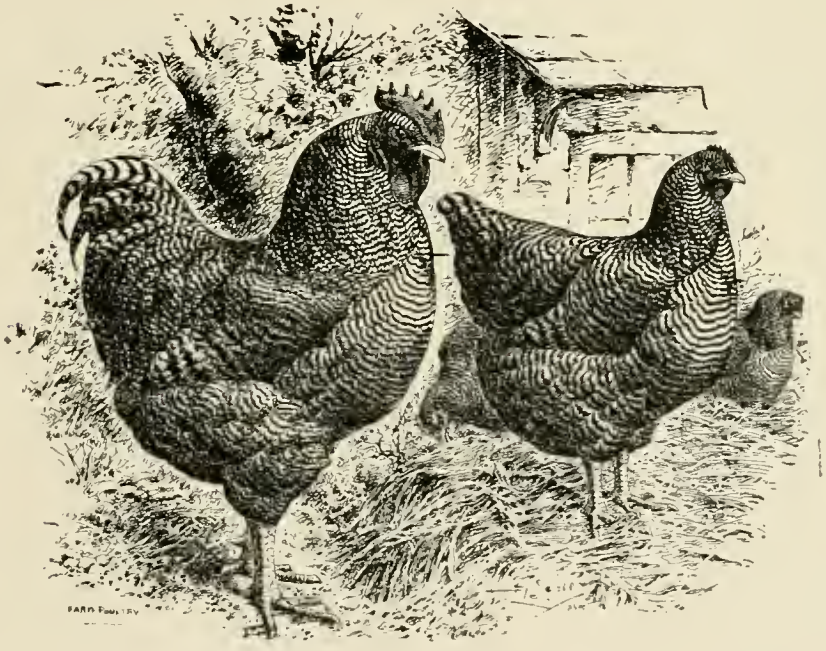
In the absence of a definite plan, along these lines of breeding it may be noted that some matings will produce better males than females and some better females than males. By making note of these we found the cause and so have established rules for such matings for each breed or variety. Along with these experiments in breeding we found that shape was a quality more often transmitted by the male and size by the female, while the color was influenced by both parents.

The Standard is not alone responsible for these requirements in breeding; many modern breeds are a combination of early originals and the cross-bred progeny have tendencies to revert to their remote ancestors of both sexes; if the Standard of all breeds was warped so as to include all the different shapes and colors that crop out year after year we would soon have a lot of sub-varieties very like their progenitors.

Early Standards called for birds mating in the show pen; in fact, not mating was a disqualification. When asked what that meant some judges said, "Birds in one coop must be all fowls or all chicks." In those days they were shown in pairs or trios (one male and two females.) Others said they should match in type and es-

pecially in breast color, which was compared. When these same birds were bred as shown it was found that they did not reproduce themselves, which soon gave rise to the claim that show birds did not make good breeders, while the fact remains that the most perfect specimens are the best show birds and likewise the best breeders when properly mated.

It is safe to say that when the subject of double mating is discussed many people at first think that this system applies more to the breeding of Barred Plymouth Rocks than to any other kind; but the fact is, it was applied to this breed first, because this was the first American breed and more often because they are more largely bred than any other kind. The Plymouth Rocks of the early seventies came so different in color, the males so light and the females so



BARRED PLYMOUTH ROCKS

dark, that they were called the American Mongrel and not until they were double mated did they come so as to match in color in the exhibition pen by showing a male from the cockerel mating with female from the pullet mating. To secure well barred males it was necessary to mate such females several shades darker than the show color, and in order to produce the medium light, barred pullets, a lighter than standard male must be used. This system was criticised by breeders of other varieties but it resulted in such rapid improvement

of the breed that it has since been adopted by breeders of nearly all Standard varieties.

Even in white breeds, as well as solid and parti-colors, a male blocky enough to produce cockerel of the most desirable form will throw pullets too short in body and usually too low on shank even for utility purposes, while the long, rangy males, such as you would never think of using in your male line, will sire pullets with that desirable length of back for utility purposes along with symmetrical conformation. This refers more especially to the Plymouth Rock breed as the Wyandotte is specified as being short in all sections; yet it is possible to get Wyandotte females too short for general use.

This double mating for shape alone is often used and most frequently in breeding the American varieties because they are of a more recent origin and prone to throw a number of variations, but two separate families or matings for color are used advantageously in all classes of fowls.

The Standard for the buff varieties calls for a rich shade of golden buff, free from white in quills, or spots of white or black in web of feathers. If we mate an ideal colored male with a standard colored female they produce cockerels lighter colored than their sire, and any color lighter than standard is usually splashed with white after the second moult if not before. A dark colored buff (not red) female mated to these nice buff males will hold the color in the offspring and produce cockerels like their sire, while the pullet progeny can be bred to the proper hue by using a male darker than standard if the females are coming mealy (specked with white) in color. In the Standard description of all buff varieties black or white is equally objectionable, but breeders will use specimens showing black in wings and tail when they will not tolerate any white. If asked why, they will say that the former is easier to breed out. The tendency of the breed is to produce lighter rather than darker progeny.

When the Silver Wyandottes were first admitted to the Standard in 1882 the females were shown with widely laced plumage with small white centers. Later when the Standard asked for large oval shaped white centers it was impossible to get males from such females with hackle and saddle well striped, the wing flights the desired color, and tail solid black. The females with old style small white centers in plumage were retained as cockerel breeders while a lighter than standard male was bred to the exhibition females for open laced pul-

lets, providing of course, that these light males were from a pullet bred line. This rule applies to all varieties and the same system as regards color is effective with Golden Partridge and Silver-Pencilled Wyandottes.

When the Rhode Island Reds were first advertised, some of the promoters said that they did not want them admitted to the Standard because the description would no doubt interfere with their utility qualities, but it was necessary to put them on the list to establish a fixed type and make it a law among the breeders. In formulating a standard it was the aim of the framers to omit everything that would not make them a superior practical fowl. Those who bred them soon learned that the brilliant red males came from such when mated to a female lighter than the red females that were winning prizes, and that in order to get that black ticking in the neck hackles of pullets and hens it should show in the hackles of their sires as well as dams. And while it will be proposed to eliminate these black tips in lower hackle of females from next Standard the most desirable red will no doubt be secured by mating the best colored males to lighter females and the standard females to a still darker male. Thus results will be more satisfactory than the mating of the finest show birds together as one family.

The Dark Brahmas are another breed that has been double bred with excellent results. The best exhibition males are bred from like when mated to hens or pullets that are darker than the standard description, and too dark to be nicely pencilled, while the distinctly marked females are mated to a male that would be termed a cull as regards color, too light throughout, and get pullets that are exquisitely colored.

The Partridge Cochins are bred by same rule of mating. A male dark as desired for showing is too dark to sire nicely pencilled pullets with a mahogany red ground color, and females of this description are too light to produce good colored males free from white at base of neck hackle and in wings or tail. The dark colored females and light colored males are retained for breeders with show males for cockerels and exhibition females for pullets respectively. This same rule will apply to Partridge Plymouth Rocks and Partridge Wyandottes although they are of a more recent origin.

With the present standard it is utterly impossible to breed both sexes of prize winning Brown Leghorns from one mating. To se-

cure males with neck hackle, back, and saddle distinctively striped with black and having a rich brilliant red edging requires a darker than standard female with a distinctively striped hackle and more or less shafting in back to mate to the male you wish to reproduce. While the finely strippled, soft even brown pullets must be mated to a male with little or no striping in back or saddle, but penciled instead and much lighter than a show bird.

Of course, in mating all varieties great stress is placed on the importance of their being from carefully bred ancestry. One might find an ideal cockerel breeding female, according to the traditions of that race, and mate her to the perfect male, of same breed, and if both were not line bred with same general principles the results would be far from satisfactory. On the other hand a cockerel possessing all of the characteristics of a nice pullet breeder is doubly invaluable when we know that his dam was our most perfect hen or pullet. In fact it is better to breed our prize males to females from a line of superior cockerel producers and our prize females to males we know came from like quality, even though neither the hens of the cockerel family or the cockerels of the pullet line are as good as others which may be from inferior stock. One of the easiest and most certain methods of improving our stock from year to year is to save a sitting of eggs laid by our best hen, mark the chickens from them and use her best sons at the head of our breeding yards the following year.

In breeding show birds too much importance cannot be attached to vitality. No matter whether the sexes are unrelated or akin they must be strong, active and vigorous to produce winners. The stamina of an exhibition bird determines its style and actions while in the show room and its good condition has as much to do with the prizes it will win as its fine feathers. Then the confinement of the show pen, the journey to and from the show, and late hours under artificial light are all trying to the health of the feathered race and it is a strong constitution that will withstand this ordeal and at the end of the show season be ready to go into the breeding pen and to work. Chickens hatched and reared by hens will withstand showing better than those hatched in incubators and reared in brooders. The latter may look as good at the start and may win as many prizes, but the difference will be discernable at the end of the campaign if not before. It is only a part of the breeding of show birds, to com-

bine the sexes so as to embody in the embryo germ the desired shape, size, and color. It is a larger part to surround that germ and, later, miniature show bird with the environment most likely to cause it to grow without a halt and develop into a nice show specimen. If kept in small yards during the day or crowded at night in cramped roosting quarters at any time from the shell up, we can not expect well shaped chickens. If deprived of sufficient nutrition for only a few days while growing, it will show in dull feathers, white where solid color is desired, and lack of lustre throughout the plumage. Anything that tends to reduce a chicken's vitality or subtract from its comfort causes a loss in symmetrical form, beauty of markings, and chances of prize winning, for proper physical development and standard excellence go hand in hand.

There's a time in the life of every chicken when it looks better than it ever has before or ever will again. With a cockerel that time is usually when he has just reached maturity. His comb is the right size, compared to his weight, his neck and saddle are full grown, his tail feathers all in, and he is ready for the show. With a pullet this is just before she begins to lay, which will depend on the breed, the environment while growing, and the time of hatching, although the first egg can be delayed several weeks by moving a pullet from one part of the farm to another. Cockerels are usually longer maturing than pullets of the same breed.

When shows are early, the chicks must be hatched early the previous spring to be in their prime. If late in the winter these early hatched birds will have passed their best or be overripe. Even June is not too late to hatch prospective winners and they will do as well as those brought out earlier if given plenty of room, green grass, and low down shade, provided, of course, they have their own range, away from the larger chickens and matured fowls.

All this seems like a lot of work for a few poultry prizes, but if you are fortunate enough to secure some premiums on birds of your own breeding and rearing, you will find the anticipation while growing them and the realization when shown to be worth all or more than the cost.

## CHAPTER VI.

## HOUSING OF POULTRY.

By JAMES DRYDEN—Oregon Agricultural College.

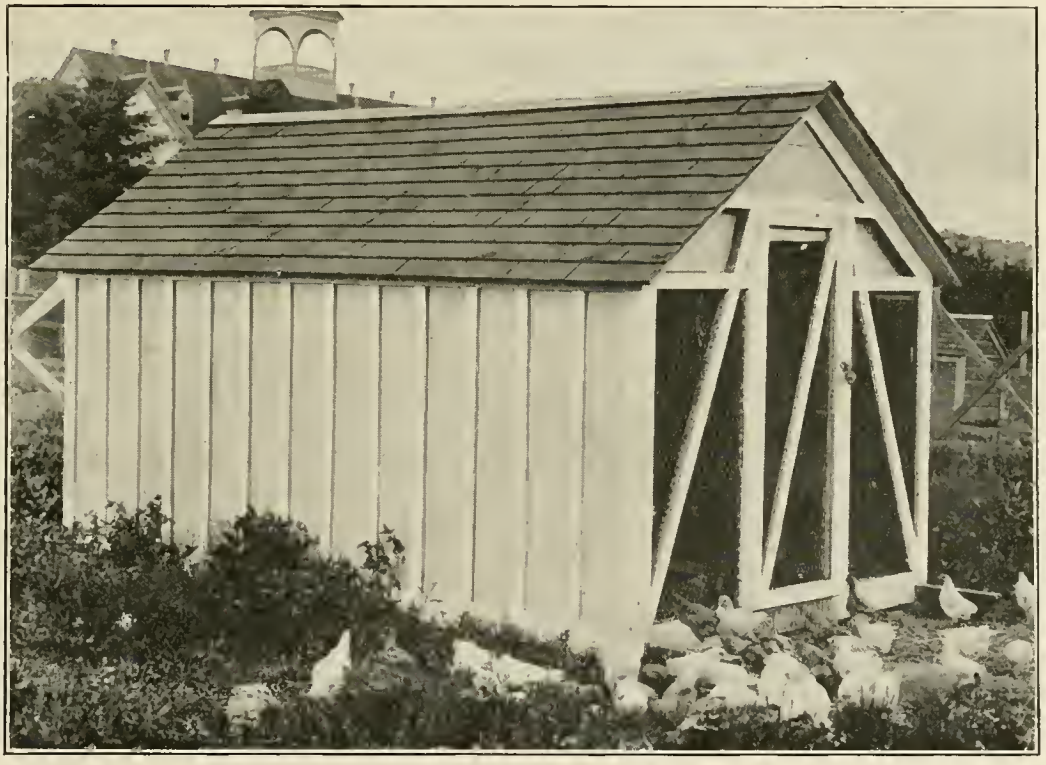
Poultry houses may be divided into two classes—1: Small colony houses; 2: Large stationary houses.

**Colony Houses.** A colony house is usually understood to mean a movable house, but the name is frequently applied to small stationary houses. We will discuss it here as a small house, portable or stationary, sheltering one colony of fowls. The colony house system had its origin in England. It has been during the past ten years only that the merits of the system have had much consideration in the United States, though in special districts, notably in Rhode Island, colony houses have been used for fifty years.

1—**Portable Colony Houses.** The portable house is an outgrowth of the demand for keeping fowls on clean ground. By this system fowls may be kept under best natural hygienic conditions. Second, this system fits in with a system of crop rotation on the farm. Third, it enables the farmer to make profitable use of much of the waste food and by-products of the farm. Much of the trouble from diseases among fowls comes from keeping them on the same ground year after year, and to move the house on to clean ground is cheaper and more effective than to disinfect the ground. By rotating the poultry with grain or other crops, two crops may be had from the same land. The portable house may be moved on to stubble fields in the fall, where the waste grain, the weed seeds, insects and worms are plentiful. In this way they often rid the fields of grasshoppers and save valuable crops. By this system the droppings from the fowls are scattered over the fields, which obtain the immediate benefit of this valuable fertilizer. The chief objection urged against the portable house is that it entails more labor in caring for the fowls when housed at a distance from the dwelling house. On the other hand, fowls in stationary houses need considerable care in the way of cleaning and feeding that fowls on free range do not.

(a) **The Size of Portable House** will be governed, first by the size of the flock it is desirable to keep together; second, by climatic conditions; and, third, by the horse-power required to move it.

Assuming that 2 sq. ft. of floor space and 50 fowls in a flock are ideal conditions, it would require a house 7x14 or 8x12 to meet those conditions. A team of horses will move a house of that size if not made of too heavy materials and the ground is not too steep. Colonies vary in size from about 25 to 100 hens. In Rhode Island the flocks average about 40 or 50. In California, on the large poultry farms, the flocks average about 100, allowing only 1 sq. ft. per fowl: in Rhode Island about 2 sq. ft. The labor in building a 50-hen house will be practically the same as a 25-hen house. **(b) Moving the**



OREGON OPEN-FRONT COLONY HOUSE FOR CHICKS—Size 5x12 Feet

**House.** Portable houses are usually built on runners. A rope or chain, two clevises, and a team are the necessary equipment for moving the house. Another method is a two-wheeled truck attached to two skids, the house being placed on the skids. In England the houses are usually on wheels attached to the house. On the large farms in California the plan is to move the houses once a month. They should be moved just as often as necessary to keep the fowls on clean ground. Grass sod or clover or alfalfa fields are better than land with little or no vegetation. This will furnish the neces-

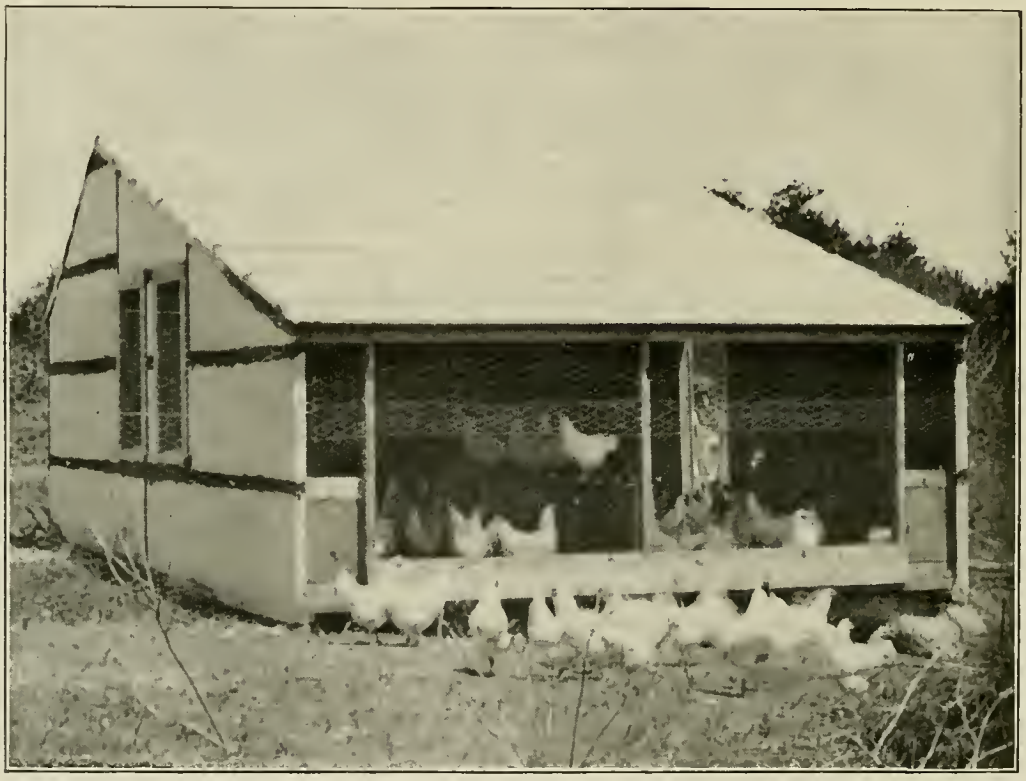
sary green food. In sections where deep snow covers the ground a month or more at a time, it will be advisable to pull the houses near together where it will be more convenient to care for them. Under such conditions it will pay to provide cheap scratching sheds.

2. **Ventilation:**— Lack of proper ventilation causes more trouble probably in the flock than anything else. Dampness, drafts, and impure air are results of poor ventilation. They mean diseases, lack of vitality, and lack of eggs and profits. Fowls are more susceptible to colds than farm animals. **(a) Dampness** in the poultry house is principally caused by extremes of temperature between night and day. Warm air holds more moisture than cold air. In a house that is warm during the day, such as a closed house with glass windows is likely to be, the air during the day will take up so much moisture that at night, the temperature falling so low, the air will be totally saturated. The only practicable way to equalize the temperature and thereby obviate dampness is to ventilate the house well. Dampness on the walls is a sure indication of poor ventilation. It means that the air in the house is so saturated with moisture that it condenses on the walls. It is not damp walls that make damp houses. It is the moisture in the air that causes the dampness on the walls. The dampness on the walls is taken out of the air, and the air is therefore drier to that extent. Dampness on the walls, however, means a saturated air, and a saturated air means that the air has all the moisture that it can hold. Dampness may be overcome either by taking out the glass windows and opening the doors during the day; in other words, airing the house out well; or by keeping up the temperature at night by artificial or other means. Extremes of daily temperature must be avioded. **Artificial heat** in poultry houses has never yet been demonstrated a success. A hen can stand a good deal of cold, but she can't stand a hot-house during the day and a refrigerator at night. This dampness will be overcome by leaving one end or one side of the house partly or entirely open day and night. This is called the "open-front" house. To avoid excessive cold at night and at the same time provide for free circulation of air, a curtain of cloth or canvas may be dropped down over the opening at night. A porous material must be used, such as burlap, muslin, or light weight of canvas. The main point is to increase the ventilation until excessive dampness has been overcome. Fowls will maintain better health roosting out

in the trees in all weather than in poorly ventilated, damp houses. **(b) Draft.** Poultry catch colds very readily from drafts in poorly constructed houses. Better let them roost in the trees than in a warm house through which the drafts whistle. Colds and catarrh are always found in such houses. No direct wind should strike the fowls on the roosts. There will be less danger from drafts if the temperature and moisture conditions of the house are right. **(c). Air Supply.** The importance of ventilation for fowls will be better appreciated when it is understood that they require a larger supply of pure air than live stock, probably due to the fact that the temperature of a hen is higher than that of other animals. It has been estimated that the hen, in proportion to her weight, requires double the weight of oxygen that a man or horse requires. The amount of air breathed per 1000 lbs. live weight of hen is given by King as 8,272 cubic feet in twenty-four hours; the requirements for man being 2,833, and for cattle 2,804 cubic feet in twenty-four hours per 1000 lbs. weight.

**Different Types of Colony Houses.** While it is believed that the colony house at the Oregon Experiment Station will meet the requirements of most farms, it is not expected that it will suit all conditions. There are different styles of houses that will give good results, and each farmer must decide for himself which best meets his demands. There are six different styles of colony houses that may be enumerated. **(a) The California House.** On the large poultry farms at Petaluma the prevailing type of house is about 7x12 feet, some a trifle larger for 100 fowls. It has a gable roof. One-inch siding placed upright, frequently not battened, is used for the walls. The houses have no floors. The sills are 2x6's, which make the runners. There is no studding. The plate and rafters are 2x4's. No dropping boards or platforms are used. The ventilation is furnished in the gable end over the door. **(b) The Rhode Island House.** The typical Rhode Island house is 10x12 and 6 feet high. It has a door and a window in the side of the house. No floors and no dropping boards are used. The sides are made of unmatched lumber. **(c) The Tillinghast House.** This is a stationary house. The preferred size is 8x16, 6½ feet high at center and 4 at eaves. It has a gable roof. It is divided into two compartments—a roosting and a scratching room, and the scratching room is all open in front. There are two windows in the south side. Rejected railroad ties are

used for foundation. It has no floor, but it is graded up with earth to the level of the sills. The fowls have free range, the houses being placed about 100 feet apart. **(d) The Tolman House.** The special feature of this house is the long-pitched roof in front, which comes down to about 4 feet from the ground. The rear slope is shorter than the front. The highest point of roof is 7 feet. The preferred size is 21x14 feet, and accomodates about 200 hens. Smaller houses, however, are built on the same plan. It has an open front on the low side covered with netting. There is a door in one end and a window in the other. **(e) The Oregon Experiment Sta-**



TOLMAN FRESH AIR POULTRY HOUSE FOR 75 TO 100 BIRDS

**tion house** is built on the fresh-air plan, and is sufficiently long to provide roosting quarters some distance from the open front. **(f) Shed Roof House.** A small house will be cheaper to build with a shed roof than with a gable roof. The labor in building will be less. For a flock of 25 fowls a house 6x8 will be large enough, (see Utah Bul. 102). The fowls, however, are more exposed to winds or drafts in a small house than in a large one where the open-front is used, because they cannot get so far away from the opening. This statement does not apply to

colony houses, the subject of discussion. With a small house it will usually be better to cover the opening with canvas or burlap. This canvas may be put on a frame and hinged at the top to open outward. The opening may be about 3x6, the bottom being boarded up about 2 feet.

## THE LARGE STATIONARY HOUSE.

Large stationary houses are usually built long and narrow, varying in width from 10 to 20 feet and in length from about 25 to several hundred feet. On some of the large poultry farms, houses 500 feet long and more are frequently seen. They are usually divided into pens, with either wire, board, or canvas partitions not more than 25 feet apart. The stationary house is almost invariably used in connection with the system of yarding fowls. This is to keep the different flocks separate and to prevent crowding together in large numbers.

The advantages of this system of housing are: (a) Large numbers of fowls may be kept on a small area. Under the most intensive conditions, allowing 100 square feet of pen and yard space per fowl, it is possible to house 2000 fowls on an acre of ground. On some of the portable colony house farms, but 50 fowls to the acre are allowed. (b) Another advantage of the large house is the convenience in caring for the fowls. With a large stationary house conveniently located the labor of feeding, watering, and gathering the eggs can be done with greater economy than under the colony system. A comparison of the walking required in caring for a thousand hens under the two systems would figure as follows: with 20 colony houses set 150 ft. apart in the row, and the attendant making the rounds of the houses three times a day, feeding, watering and gathering eggs, 550 miles would be traveled in the course of a year. Walking at the rate of 4 miles an hour and figuring the time at 15c an hour, the time spent would be worth $20.60. A continuous house 300 feet long, housing 1000 fowls, would require about 31 hours of a man's time walking, worth $4.65, a difference of about $16.00 in favor of the continuous house. (c) One large house will take less labor and material to build for a certain capacity than a small house. The form of construction influences the cost. If partitions are built in the house there will be little difference in the amount of material

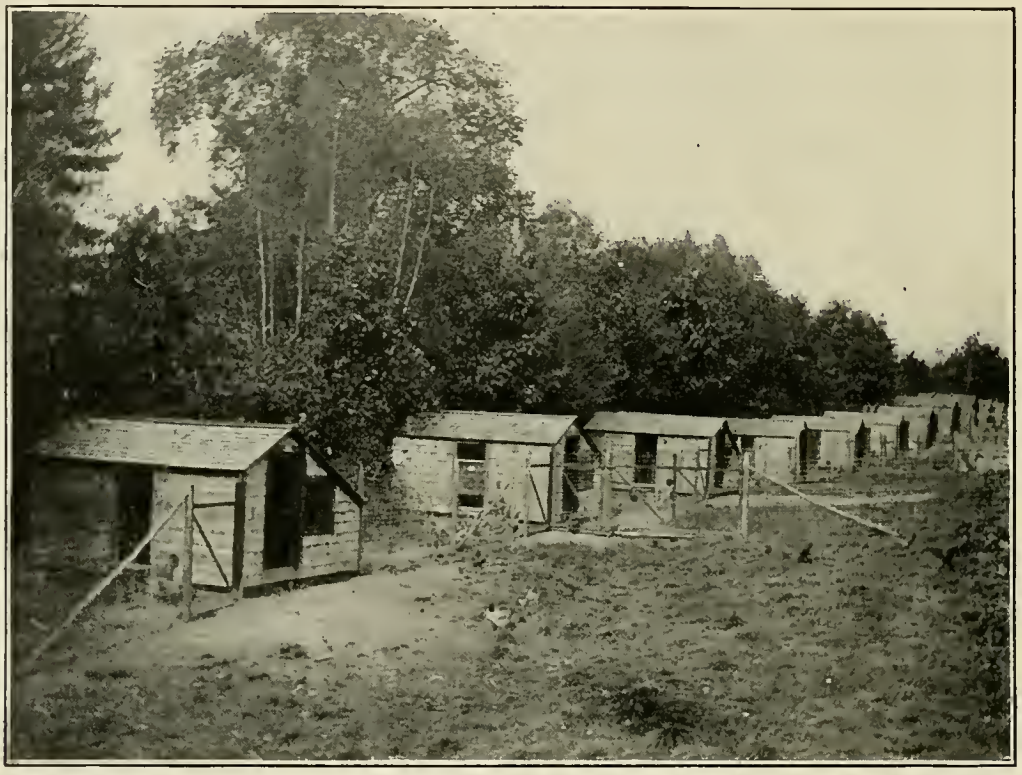
used, but there will be less work because the partitions will take less labor to build than the ends of the colony houses. (b) The large house will be warmer in cold weather than the small house, because there is less surface exposed to the outside cold air, but the difference will be small.

1—**Different Types of Stationary Houses.** Stationary houses may be divided into three classes: the warm closed house, the curtain-front house, and the open-front house. **(a) The warm house** represents the attempt to reproduce spring conditions in winter time, in order to get eggs in the winter season. Warm houses, so-called, have been built with the idea of making the fowls comfortable. The walls are double-boarded, with a dead-air space between, and frequently this space is packed with sawdust, hay or other material to keep out the cold. Plenty of glass windows, often double windows, are put in the south side of the house. The attempt to reproduce spring has been a failure. Instead of this being a comfortable house it has been very uncomfortable. It has proven to be invariably damp, and a damp house is alwys cold. The failure is due to the wide range of temperature prevailing in it. It is a hot-house during the day and a refrigerator at night. The sun striking through the windows during the day raises the temperature of the house, and as the temperature rises the air takes up moisture from any moist surfaces in the house,— from the droppings, the breath of the fowls, and from outdoor air,— which is drawn in through cracks or openings in the walls. The glass windows permit rapid cooling at night, when the air becomes saturated, which means that it has as much moisture as it can possibly hold. It is impossible in a warm or close house with glass windows facing the sun to avoid extremes of temperature, and therefore dampness, without artificial heat. So far it has never been demonstrated that artificial heat is practicable. At the Utah station by raising the temperature at night by artificial means 4 to 5 degrees, an apparent increase of 40 per cent in egg yield was secured during the winter months. (Bul. 102). The danger in using artificial heat seems to be in a decrease in the vitality of the stock. This may, however, be due to the method of using it. But whether some system of artificial heat that would maintain an even, not high, temperature throughout the night can be furnished at a profit remains

to be demonstrated. (b) After the warm closed house had been proven unsatisfactory, there was a demand for a fresh-air house. The warm, or so-called comfortable, house was believed to be the cause of many failures of large poultry farms. It undoubtedly was one of the causes. To overcome the lack of fresh air the glass windows were taken out, and to keep the house a little warmer and at the same time prevent drafts, burlap or canvas was tacked on the opening. The canvas is usually stretched on a light frame and put in the window opening at night or on cold stormy days; at other times it is left open, so as to allow as much sunshine and fresh air to enter as possible. Such a house was then called a curtain front house. This made it essentially a cold house. The idea of providing warm quarters has been largely abandoned. The Maine Station house represents a good type of curtain-front house. This house is divided into sections of 20 feet each, and it is 20 feet wide. Each section has two windows of 12 lights of 10x12 glass. A space between the windows 8 feet, 10 inches long by 3½ feet wide is covered with a frame of 10 oz. duck. Another curtain drops down in front of the roosting closet at night. The glass windows are not an essential part of the curtain-front house, as many such houses are in use that have no windows. The purpose of glass windows is to furnish additional light. Usually sufficient light will enter through the curtain. (c) The open-front house brought the fowls still nearer natural conditions. This is the real fresh-air house. For all practical purposes the fowls are roosting in the open air. The idea that led to this house was that all the housing that fowls require is a little shelter from the winds and storms. They can stand a good deal of cold, but not extremes of daily temperature and dampness.

The warm house with glass windows was a step backward in poultry keeping. Instead of furnishing ideal conditions for winter egg production it furnished ideal conditions for sickness and low vitality in the flock. It will have to be discarded, until a satisfactory way of furnishing artificial heat has been provided. But artificial heat should not be tried except in an experimental way. The curtain-front house in certain sections is the ideal house, but it is doubtful if the second curtain in front of the roosting platform is desirable in any section. I would not advise it. One

objection to the curtain front house is that it requires considerable attention opening and closing it, and if this is neglected there will be trouble. In cold stormy sections where the thermometer gets considerably below zero the curtain is desirable, but in most sections of the United States it may be omitted altogether. The open-front house, built in such a way that the fowls will not be exposed to drafts and cold winds, will give the best results.



COLONY HOUSES.

## CHAPTER VII.

## FEEDS AND FEEDING.

By F. S. COOLEY

The successful practice of poultry feeding covers such an extended and varied range of experience that one is often inclined to think that results are obtained in spite of, rather than because, of the methods pursued. In a short chapter on feeding it is utterly impossible to discuss all the different systems of feeding practice. It is better, therefore, to consider the principles, leaving their application largely to the judgment of those who are to perform the work.

I. **Nutrition** is, broadly, the process by which the organism is kept in a normal condition of life and growth. It includes the various means by which body tissues are repaired or built up, energy supplied to maintain the heat and provide for the activities of life, and the products incident to normal life. Nutrition involves digestion, absorption, circulation, and respiration.

The body is composed of certain compounds, or groups of compounds, which are built up from food materials taken into the digestive organs. These food materials are not transferred directly as such to the tissues or products of animals, but are split up into certain compounds called nutrients.

**A Nutrient** is any single chemical compound which can contribute to the substance of the tissues and fluids of the body and thus assist in its activities. Besides water and mineral matter, which are inorganic, there are three classes of organic nutrients which we consider in animal feeding, viz., protein, carbohydrates and fat.

**Protein** includes a group of compounds, also called proteids or albuminoids, which are composed of water, carbondioxide, and nitrogen, with a small amount of sulfur. The presence of nitrogen distinguishes them from other classes of nutrients. Their particular function is to furnish material for the nitrogenous tissues and products in the body, such as lean meat, egg albumen, etc. Neither carbohydrates nor fat can form nitrogenous tissue.

**Carbohydrates** include starch, sugars, gums, etc., and are chiefly valuble as producers of energy, maintaining the body temperature and protecting other more valuable nutrients from waste.

**Fat** is well known as such in the animal, and in the form of oils in seeds and vegetable products. It is useful as a nutrient in providing material for body fat. It is also more productive of energy or heat than the other nutrients, its value being rated two and one-half times as great as starch for this purpose.

II. **Digestion:** Seeds and other food materials in the condition in which they are swallowed by poultry are not immediately available to nourish the system. Their nutrients may be encased in a dense fibrous skin or husk that resists the solvent action of the digestive fluids. They may be dry, lumpy, and hard. It becomes, therefore necessary to crush and soak and grind the substances and extract their nutritive materials, absorbing them into the circulatory system along with the blood. More or less of the food eaten is not digested and is voided from the digestive tract in the excreta. Only the digested portion is of value in nutrition. The undigested food may serve to give bulk to the ration; but it may also place a heavy tax upon the energy of the animal, sometimes to the extent of entirely offsetting its nutritive value.

**The Digestive Organs** of fowls consist of the beak, or mandibles, for picking up food and sometimes cutting or tearing it; teeth, though common in prehistoric birds, are wanting in domestic fowls. Food is moistened in the mouth with saliva and passes whole down the gullet to an enlargement or sack at the base of the neck called the crop. Here it soaks, ferments, and softens, after which it passes down the gullet to the stomach where gastric juice is secreted and mixed with it. The stomach opens into the gizzard, a strongly muscled sack where by means of sharp grit, stones, etc., (the teeth of the bird), the food is ground more finely than in the mouths of many of the larger animals. The intestine, a tube several feet in length, receives the pulped food from the gizzard, subjects it to the action of juices from the pancreas, the bile, and the spleen, absorbs the digested and dissolved portions, and passes the undigested residue along to the cloaca, where it mixes with the waste materials from the genito-urinary canal which empties into the intestine at this point.

Only the digested portion of the food which has been absorbed and passes into circulation with the blood, after being dissolved by digestive fluids, is of consequence in nutrition. The undigested

residue must be subtracted from the original material in computing nutritive value. In mammals the digestibility of a food substance is measured by the difference between the amount eaten and the solid excreta. The proportion of the food which is digested, expressed in percentage, is called the *digestive coefficient*, e. g., if sixty per cent of the protein in clover hay is digested the digestion coefficient for protein in that lot of hay is 60.

The urine represents the broken down tissues of the body and the nitrogenous nutrients that have been split into their simpler compounds in performing their nutritive office. It is easy to keep a close check on the nutritive effect of a given ration fed to mammals by comparing the food eaten with the separate excretory products; but in fowls the difficulty of separating the solid from the liquid excreta has prevented the study of digestibility, so that scientists assume digestive values from those learned with other animals.

**Variations in Digestibility** are due to different causes:

a. Young grasses and forage plants are far more digestible than mature ones; hence new grass shoots, alfalfa, clover, etc., have a higher nutritive value than if allowed to become coarse and woody.

b. Exposure to rain and weather during curing depresses digestibility of forage plants.

c. Amount and frequency of feeding do not affect digestibility to any great extent.

d. Too much starch or carbohydrate material in a ration lowers its digestibility. A proper balance between protein and non-nitrogenous nutrients thus at once makes a ration more effective and less wasteful.

e. Cooking does not increase digestibility; on the other hand it may sometimes have an opposite effect.

While these matters might be discussed at greater length, such discussion would defeat the purpose of this volume to be brief and concise.

III. **Nutritive Effect:** The important point in the consideration of a ration or food substance is its effect on the formation of the desired product. We should not confuse nutritive effect with the digestibility or composition of foods. Feeds, which in themselves are valuable and proper, fail to bring results when used im-

properly, under unfavorable conditions, or given to the wrong kind of stock. Green bones are highly nutritious but, fed in excess, may defeat the object of increased egg yield by upsetting the digestive organs. A freezing or damp room, or one infested with lice, may neutralize the effect of a perfect feeding system. Old fowls or those in bad condition may refuse to lay with the best possible egg-producing diet.

IV. **Ease of Digestion** is not the same as digestibility. A substance may have a high digestibility and yet tax the digestive organs severely. Milk is both highly digestible and easily digested. Salt pork is digested with greater difficulty, though its digestion coefficient is high.

V. **Objects of Feeding:** The principal objects in feeding fowls, from a business standpoint, are the production of flesh, the maintenance of life, and egg production. All the materials used in these various products are contained in the blood, which is replenished by nutrients absorbed from the food consumed. The red blood contains the life principle. An intense vitality and life is characteristic of domestic fowls and it should be fostered by great liberality in the supply of blood-forming materials. To better understand these requirements let us consider the needs of poultry in respect to maintenance, growth, and egg production.

I. **Production of Body Tissue** (Growth).* "Analyses made, mostly by Jenter, at the New York Experiment Station, give as the average composition of a Leghorn hen, typical of the laying breeds:

55.8 per cent water
21.6 per cent protein
17.0 per cent fat
3.8 per cent ash

This is not the composition of the edible portion only, but of the entire body, feathers, viscera, blood, bones, etc."

In feeding, it is necessary to provide raw materials, not for the marketable or edible portions alone, but for the whole bird.

Other analyses show substantially the same composition, except

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(*Jordan's **The Feeding of Animals.**)

that in young and immature birds the fat is less and the water more, while a fat capon showed the following:

41.6 per cent water
19.4 per cent protein
33.9 per cent fat
3.7 per cent ash

Reducing the fat in this case would tend to bring the other constituents on a parity with those of the laying hen.

These analyses show the importance of protein and the mineral nutrients and that water is a prime requisite.

2. **Maintenance of Life.** (Production of Energy). While the need of materials for producing new tissues and growth must be met in feeding, it is all important to maintain the vital processes from start to finish. This does not of itself constitute profitable production, but must be provided for before the latter can begin to take place.

Among bipeds those wearing feathers, at least, are very much alive. The body temperature of the members of the chicken family is close to 105 degrees F. summer and winter. To maintain this in freezing weather and provide for the ceaseless activities of the organization requires a large supply of energy-producing materials in the shape of food.

It takes about three-fourths to four-fifths as much nutritive material to maintain a flock of hens without production as to keep them in full laying condition. To express this in calories of energy, the maintenance requirement for one hundred three to five pound hens is 30,720 calories per day, and 31,800 calories of energy is required daily for 100 hens weighing five to seven pounds. In full laying the requirements would be 41,200 and 37,440 calories of energy respectively.

**Calorimetry** is a term used to designate the energy or heat value of materials. One Calorie of heat is required to raise one pound of water four degrees, Farenheit. Expressed in terms of work this is equivalent to the power necessary to lift one ton vertically 1.53 ft.—1.53 foot-tons. One pound of digestible fat in the food is computed to have heating power of 4,220 Calories. One pound of either carbohydrates or proteids is considered to have a heating value of 1,860 Calories. When the word Calory is written with a capital C,

as in the foregoing, it is understood to mean the value of 1000 calories written with a small c.

3. **Reproduction** (Eggs). Reproduction is one of the most important functions of animal life. Nature has instilled into all forms an irresistible impulse to reproduce. To what extent the sum total of new organisms may be influenced by nutrition of parent stock we do not know. It is a common opinion, however, that a phenomenal egg production during the first year or two will reduce the subsequent laying capacity of fowls. Feeding and good management will surely increase the egg product during the pullet and yearling seasons. Old fowls are regarded as less prolific and perhaps much less prolific when forced to the limit during early life.

The egg which, aside from the shell, is potentially a chick, shows in the general proportions of the constituents a striking resemblance to the body of the grown bird. The fresh egg with a good firm shell consists of about

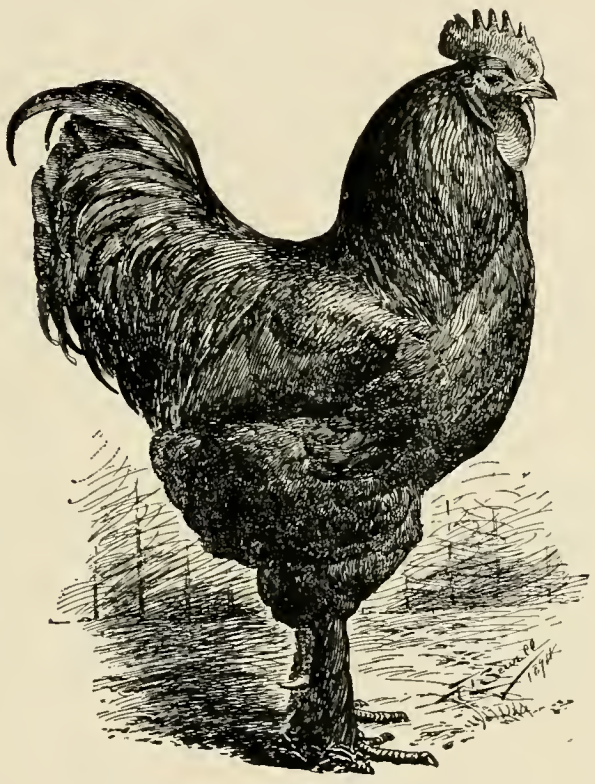
11.4 per cent shell
65.7 per cent water
8.9 per cent fat
11.4 per cent protein
.8 per cent ash in meat of egg

This statement represents forty-two analyses of over 400 eggs of various breeds by Thompson and Wheeler of the New York Experiment Station. The fact that 35 per cent of the dry matter of eggs is mineral, emphasizes the need of providing fowls liberally with the raw materials for its supply.

It is a matter of universal observation that spring is the laying season for fowls. The words of the philosopher, "In the spring the fancy lightly turns to thoughts of love," find their counterpart in the entire animal kingdom. All nature seems to feel an awakening and thrill of exuberant life. Noting the details of spring conditions, the warmth, the sunshine, the budding grass and vegetation, the teeming insect life and the abundance of food suggests reasons for the quickening activities and abundant egg production of domestic fowls. By prolonging spring conditions we may well expect to extend the laying season, and in a degree as we supply the essentials throughout the year we may hope for resultant benefits.

VI. **Consumption of Nutrients:** (Amounts Required.)

1. **Maintenance requirements:** One hundred five-pound fowls require daily to maintain them in good condition without production according to the feeding standard 16.5 pounds of dry matter, 2.25 pounds of protein and 14 pounds of carbohydrates and fat. 20



BLACK LANGSHAN COCK

pounds of average wheat will supply 2.02 pounds of protein and 14 pounds of carbohydrates and fat. A very small amount of meat or a few insects or grubs would make up the deficiency.

Maintenance standards daily per 100 lbs. weight.

| | Dry Matter | Ash | Digestible | | Fat |
|---|---|---|---|---|---|
| | | | Protein. | Carbohydrates | |
| Capons 9-12 lbs. ..... | 2.30 | .06 | .30 | 1.74 | .20 |
| Fowls 5-7 lbs.... ..... | 2.70 | .10 | .40 | 2.00 | .20 |
| Fowls 3-5 lbs... ..... | 3.90 | .15 | .50 | 2.95 | .30 |

It will be found that the requirements per hen are practically the same whether she weighs three or eight pounds, and that about one pound or one pint of dry grain or its equivalent is a daily maintenance ration for five hens

2. **Growth** (Production of Flesh).

According to age from two to four times as much nutritive material is necessary for growing chicks as is required to maintain mature fowls for the same total live weight. About twice as much protein and ash is needed for the production of flesh and bone at this stage of development for the same amount of starch and heat producing nutrients. To supply this, beef scraps or other animal foods are practically a necessity. Bone meal or cut bone is a source of supply for the mineral elements.

There are certain important considerations in securing rapid growth. It means the early marketing of the cockerels, getting them out of the way in three months or so from hatching, at good prices. It means an early development and probable early laying by the pullets. If these can be made to lay in the fall and early winter when eggs are 40 to 75 cents a dozen they become very profitable. In confinement where all the food consumed is provided, rapid growth is less expensive than slow growth.

I have figured that where chicks can be made to weigh three pounds at about twelve weeks old it is done at a cost of 9.6 pounds of food apiece, which would be worth at 2½ cents per pound, 24c. Allowing 16c for the newly hatched chick the cost of a 3 pound broiler would be 40c. On the other hand, to produce the same weight in 24 weeks by slow growth would add about 20c to the cost, or 50 per cent.

With plenty of free range in stubble fields where insects abound, the apparent cost of growing chickens is so slight that they come in the nature of clear profit, if losses can be avoided.

Ducks grow faster than chickens and consume much more food in an equal time. Standards for the two varieties of birds are therefore given separately.

Standards for Chicks—Per day and 100 pounds live weight.

| | Dry Matter | Ash | Digestible Protein | Digestible Carbohy. | Fat | Fuel Value Calories |
|---|---|---|---|---|---|---|
| First 2 wks..... | 10.1 | .5 | 2.0 | 7.2 | .4 | 18,300 |
| Second 2 wks..... | 9.6 | .7 | 2.2 | 6.2 | .5 | 17,730 |
| From 4-6 wks. old.. | 8.6 | .6 | 2.0 | 5.6 | .4 | 15,640 |
| From 6-8 wks. old.. | 7.4 | .5 | 1.6 | 4.9 | .4 | 13,780 |
| From 8-10 wks. old. | 6.4 | .5 | 1.2 | 4.4 | .3 | 11,680 |
| From 10-12 wks. old | 5.4 | .4 | 1.0 | 3.7 | .3 | 10,000 |

Standards for Ducklings.
Per day and 100 pounds live weight.

| | Dry Matter | Ash | Digestible Protein | Digestible Carboh. | Fat | Fuel Value Calories |
|---|---|---|---|---|---|---|
| First 2 wks.... .... | 17.2 | 1.1 | 4.0 | 11.2 | 1.4 | 34,180 |
| 2-4 weeks ..... | 17.0 | 1.5 | 4.1 | 10.1 | 1.3 | 31,900 |
| 4-6 weeks... ..... | 11.2 | .8 | 2.7 | 7.0 | .7 | 21,000 |
| 6-8 weeks ... ..... | 8.0 | .6 | 1.7 | 5.2 | .5 | 14,940 |
| 8-10 weeks ... ..... | 7.0 | .5 | 1.4 | 4.7 | .4 | 13,030 |
| 10-15 weeks ... ... | 4.6 | .3 | .9 | 3.2 | .2 | 8,470 |

3. **Egg Production** in kind is substantially like growth in newly hatched chicks so far as necessary raw materials are concerned. While fully one-third of the dry substance of the egg is mineral, one-third also is proteid material. Its production involves therefore a generous percentage of these nutrients in the feeds given. While it takes twenty pounds of grain, containing two and one-fourth pounds of digestible proteids and fourteen pounds of digestible carbohydrates and fat, daily to maintain one hundred hens, to furnish materials for a sixty per cent egg production would require additional food containing two pounds of proteids,—leaving the mineral matters out of consideration. This would need the equivalent of three pounds of beef scrap and five pounds of grain in addition to the maintenance supply. Allowing one and one-half cents a pound for grain, three cents for beef scrap, and eight cents daily for accessory feeds, the cost for the sixty eggs would be fifty-five cents, or less than a cent apiece.

To maintain a similar flock producing twenty-five per cent of eggs would require three pounds less of grain, one pound less of beef scrap, and perhaps two or three cents less of accessory feeds. Thus a reduction of thirty-five eggs daily at a saving of ten cents for feed would make the remaining twenty-five eggs cost nearly two cents apiece,—practically double the cost in case of the higher yield.

The following standards are given for fowls in full laying:

Standards for Egg Production
Per day and 100 pounds live weight.

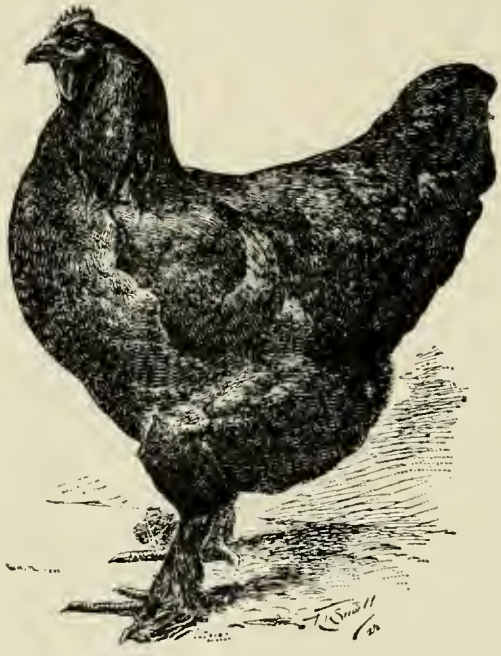
| | Dry Matter | Ash | Digestible Protein | Digestible Carbohy. | Fat | Fuel Value Calories |
|---|---|---|---|---|---|---|
| 3-5 pound hens .. | 5.50 | .30 | 1.00 | 3.75 | .35 | 10,300 |
| 5-7 pound hens .. | 3.30 | .20 | .65 | 2.25 | .20 | 6,240 |

Here again it will be noticed that the lighter birds consume about one-half more per hundred pounds live weight and just about the same per bird as do the heavier fowls.

VII. **Sources of Nutrients:** Fowls are omnivorous, eating nearly all eatable things. Two general classes of food materials may be mentioned as necessary in poultry feeding, viz., inorganic and organic.

1. **Inorganic** or mineral foods comprise water, salt, lime, phosphates, and other substances which are required in such small amounts that they are invariably supplied in the vegetable fodders.

**Water:** Every dozen eggs contain a pint of water. More than half the live weight of fowls is water. A far larger proportion than this is requisite to life, providing for exhalations and the functions of body organs. Nutrients are carried over the body in the blood which requires water to maintain its fluid condition. A supply of good water is a prime essential in poultry keeping.



BLACK LANGSHAN HEN

**Salt:** Common salt in considerable quantity appears necessary to every living animal. Most food materials contain more or less of it, but about five ounces to six hundred pounds of feed is recommended in feeding fowls. Salt plays an important role in digestion. Animals fed salt regularly are far less likely to over-eat it to their injury when opportunity offers.

**Lime:** The shell of the fresh egg, representing 11 per cent of its substance, consists almost entirely of carbonate of lime. Lime also enters largely into the structure of bones, and to some extent into other body tissues. Grains and other feeds are notably deficient in lime. It is therefore necessary to supply it to laying fowls when kept in confinement. Oyster shells and limestone grits are the most available sources of lime for feeding.

**Phosphates:** While less than ten per cent of the body of a fowl is mineral matter, that part consists largely of phosphate of lime, exceeding in proportion that of most food materials. The addition of phosphate of lime to the rations for growing chicks has noticeably increased their efficiency. Granulated bone, bone meal, or cut green bones are sources of phosphate of lime.

**Grit:** Fowls, having as they do no teeth, require sharp grits to properly grind the food in the gizzard and facilitate digestion. Good, sharp, hard limestone grits the size of peas are desirable unless the range affords a sufficient supply.

2. **Organic Foods** consist of seeds, grains, and the like, termed concentrates; and roots, vegetables, fruits, grasses, and forage plants called roughage. The main dependence for feeding poultry is the cereal grains. Some roughage is desirable to give bulk to the food, as well as some rich protein substance, like meat, to supply materials for flesh formation and egg production.

**Corn:** Throughout America corn is the most popular single grain fed to poultry. In Montana corn has not yet come into common use and our hens do not generally know what it is. It is rich in heat materials and rather fattening. It is known to give better results when fed to fowls with extensive range than when fed largely to birds in close confinement. For egg production supplementary feeds rich in both protein and mineral matters should be given in conjunction with corn.

**Wheat:** No grain comes nearer being a perfect poultry food than wheat. In Montana, the home of wheat production, fowls should thrive. Wheat screenings, frosted grain and that otherwise unsuited to milling are first-class poultry feeds. Some animal feed is needed with wheat to secure high egg production.

**Oats** are a high class poultry feed but contain in the hulls much indigestible fibre which detracts from theiir palatability to fowls.

Montana oats are better than most others on account of a heavier kernel.

**Barley** is between corn and wheat in feeding value and good to give variety.

**Rye** contains almost the same nutrients as wheat and should prove a good substitute for wheat or factor in a grain mixture.

**Flax:** This is rich in oil and protein and will enrich any grain ration. A small portion of flax, particularly during molting, is desirable. Flax fed fowls molt earlier and more rapidly. It gives a glossy plumage and fine bloom. **Sun flower seeds** have an effect similar to flax.

| Feed Stuffs | Dry | Ash | Digestible Protein | Digestible Carbo. | Fat | Food Value |
|---|---|---|---|---|---|---|
| 100 Pounds | Pounds | Pounds | Pounds | Pounds | Pounds | Calories |
| Wheat | 89.5 | 1.8 | 10.2 | 69.2 | 1.7 | 154,800 |
| Indian Corn | 89.1 | 1.5 | 7.1 | 66.1 | 5.0 | 157,200 |
| Oats | 89.0 | 3.9 | 9.3 | 48.3 | 4.2 | 124,700 |
| Barley | 89.1 | 2.4 | 8.7 | 64.8 | 1.6 | 143,500 |
| Rye | 88.4 | 1.9 | 9.1 | 69.7 | 1.4 | 152,400 |
| Buckwheat | 87.4 | 2.0 | 10.0 | 64.5 | 2.2 | 157,500 |
| Sunflower seed | 91.4 | 2.6 | 16.3 | 21.4 | 21.2 | 158,600 |
| Millet | 86.5 | 3.0 | 12.7 | 58.0 | 3.3 | 145,400 |
| Peas | 89.5 | 2.6 | 16.8 | 51.8 | .7 | 130,200 |
| Flaxmeal (C. P.) | 90.8 | 5.7 | 28.8 | 32.8 | 7.1 | 144,300 |
| Green grass | 34.7 | 2.3 | 2.1 | 21.2 | .6 | 45,800 |
| Green alfalfa | 28.2 | 2.7 | 3.9 | 11.2 | .4 | 29,800 |
| Alfalfa hay | 91.6 | 7.4 | 10.6 | 37.3 | 1.4 | 94,900 |
| Mangolds | 9.1 | 1.0 | 1.0 | 5.7 | .1 | 12,900 |
| Potatoes | 21.0 | 1.0 | 1.4 | 16.4 | | 33,100 |
| Cabbage (*) | 9.5 | 1.4 | 2.4 | 3.9 | .4 | 13,300 |
| Apples (*) | 15.9 | .2 | .2 | 14.3 | .3 | 28,200 |
| Beef scraps | 98.7 | 15.3 | 48.5 | | 15.2 | 154,400 |
| Dried blood (*) | 93.3 | 6.6 | 65.1 | 5.3 | 16.3 | 199,700 |
| Fresh cut bone (*) | 93.1 | 24.5 | 22.3 | | 16.5 | 111,100 |
| Eggs (less shells) | 34.5 | .9 | 12.7 | | 8.8 | 60,800 |
| Skimmed milk | 9.5 | .7 | 3.1 | 4.8 | .5 | 17,500 |

**Green Feed:** Young grass, clover, alfalfa, and the like form a valuable and important adjunct to poultry feeds. It is noticeable that the eggs are abundant during the grass season. Alfalfa and clover leaves are equally desirable in winter. Beets, mangolds,

(*) Digestibility not determined.
(From Progressive Poultry Culture, Bingham).

rutabagas, and cabbages form a desirable portion of the winter dietary of poultry and promote both health and egg production.

**Animal Foods:** When fowls have free range they consume large quantities of meat in the form of grubs, worms, insects, grasshoppers, etc. It is when these are abundant that chickens grow fastest and hens lay best. During the winter, or when poultry is confined, a substitute for these natural supplies of flesh must be provided or the functions of the birds become far less active. Practical experience has shown the advantage of feeding meat products to poultry. The same results cannot be secured from a strictly vegetable diet. Green or fresh bones are good. Fresh meat from horses or other animals is good in cold weather. Beef scraps have better keeping qualities for summer use, and animal meals may be used in mash to good advantage.

**Skim Milk:** One of the very best egg and flesh producing foods is skim milk. A good method of feeding it is to let it sour and pour off the whey, leaving the curds for the fowls.

**Condimental Feeds.** The use of condiments and proprietary mixtures and panaceas and egg foods is folly. One of the biggest humbugs of the age is the fiction of stock and poultry foods. As food they are worth only a small fraction of the cost. As medicine they are not needed by healthy stock and sick animals need something else.

VIII. **Feeding Standards:** Standards have been suggested under another head for feeding fowls for maintenance, egg production, and growth. These standards have been deduced from trials of many and widely varied amounts and proportions of protein, carbohydrates, and fat in feeding poultry. The amounts that on the average best and most economically secure the desired end are adopted as the standard for that purpose. These standards have already been given and need not be here repeated. They allow the feeder wide discretion in the selection of food materials, merely suggesting the requirements in digestible protein and non-nitrogenous nutrients for a given purpose. It should not be deemed absolutely imperative to follow these standards exactly. On the contrary, they are somewhat elastic and presume merely to assist the good judgment and intelligence of the feeder rather than bind him as with fetters to an empirical formula.

IX. **Computing Rations:** Any suitable feed stuff or combination of fodders that will furnish the necessary nutrients for a given purpose constitutes a ration. Thus, for maintenance we find that hens weighing from five to seven pounds need a standard for 100 pounds live weight of: dry matter, 2.70 lbs.; protein, .50 lbs.; carbohydrates, 2.00 lbs.; fat, .20 lbs.

It has been found that two pounds corn or barley, one pound oats, one pound clover or alfalfa hay, and one-half pound meat scraps will furnish this.

Mere maintenance is not commonly satisfactory to the poultryman. He must have growth or egg production besides. Five to seven pound hens in full laying require daily per 100 pounds live weight, 3.30 pounds dry matter, .65 pounds protein, 2.25 pounds carbohydrates and .20 pounds fat.

| | Dry Matter | Protein | Carbo | Fat |
|---|---|---|---|---|
| 1 lb. whole wheat..... | .9 | .10 | .69 | .02 |
| 1 lb. barley..... | .9 | .09 | .65 | .02 |
| 1 lb. oats ..... | .9 | .09 | .48 | .04 |
| 3-4 lb. meat scrap ..... | .6 | .33 | | .04 |
| 3 lb. alfalfa ... ... ... ..... | .8 | .12 | .33 | .07 |
| | 4.1 | .73 | 2.15 | .19 |

This ration carries a theoretical excess of .08 pounds of protein and a deficiency of .11 pounds of carbohydrates and fat, and should be considered close to the standard. The substitution of corn for one of the other grains would largely overcome the slight deviations which in practical feeding might be ignored.

The only way to compute rations is by trial, taking the standard feed stuffs as basal, and balancing them with such foods as will supply the deficiency of nutrients.

A balanced ration is one in which the proper proportion exists between the protein and the carbohydrates and fat. NUTRITIVE RATIO is a term used to characterize this proportion. In determining the nutritive ratio the number representing the carbohydrates is added to two and one-half times that of the fat and their sum divided by the number of the protein. The reason for multiplying the fat by two and one-half is that its fuel value is about that much when compared with that of starch and sugar.

In the foregoing ration the nutritive ratio would be found as follows:

Fat (.19) multiplied by 2½=.48 added to (2.15) carbohydrates (2.15 + .48)=2.63 divided by protein (.73)=3.6 or

$$\frac{.19 \times 2\frac{1}{2}=2.15}{.73} = 3.6$$ Therefore

the nutritive ratio, or the ratio of protein to non-nitrogenous nutrients is as 1 : 3.6.

This is a rather narrow ratio. Indian corn alone would have a wide ration 1 :10.8 while beef scrap has the exteremely narrow ratio of 1 :0.7. About 1 :4 is a good ratio for laying hens and growing chicks, while 1 :7 is all right for maintenance of mature birds.

## PRACTICAL OBSERVATIONS.

1. **Exercise.** Chickens, and particularly laying hens, require much exercise to keep them in prime condition and producing well. Fattening is best carried on where exercise is restricted to the minimum by rather close confinement. Scratching litter and wide range are ways of providing exercise to laying stock. Suspending vegetables and sheaf grain so they will jump for the feed is another method to the same end. Exercise requirements vary with different breeds and should be adapted to the kind of birds kept.

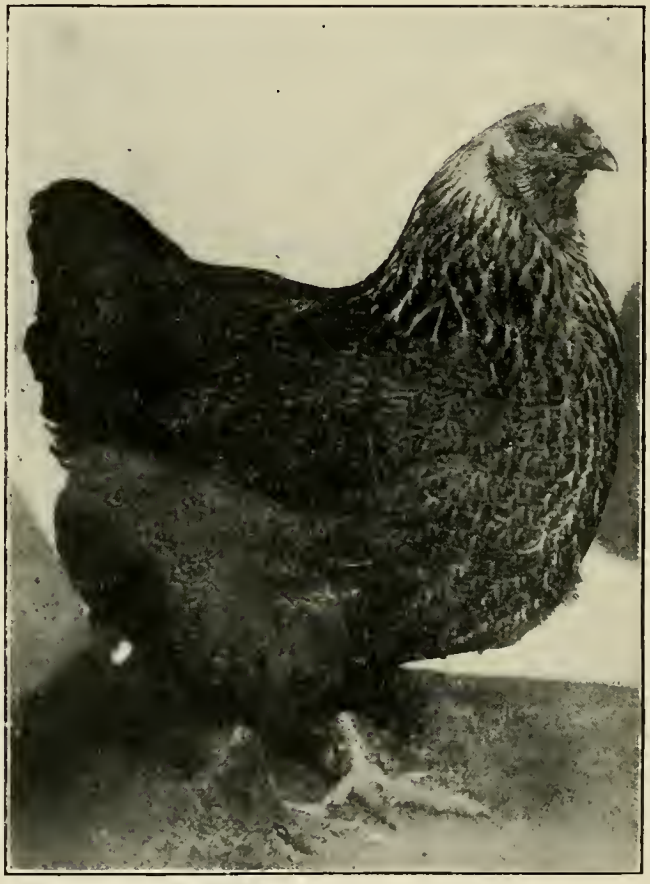
2. **Variety of Food.** Fowls are omnivorous, feeding on grasses, vegetables, seeds, insects, meat, etc. Practical experience has demonstrated the advantage of a varied dietary in the accomplishment of nearly every purpose for which fowls are kept. Two or three different kinds of grain should be fed, green vegetables or grass, meat, and plenty of grit and lime material. Kitchen waste is turned to acocunt by poultry and free range enables them to secure the variety their nature craves. Fields of grain stubble with the insect life and green vegetation will often sustain fowls in high productiveness for months without other food.

3. **Amount of Food.** The ideal art of feeding is to give enough without completely satisfying the appetite. Fowls that are gorged become inactive and lack energy. Generally the hen hungry enough to scratch for food is the layer, provided she finds enough to supply

the egg materials. While too much fat is prejudicial to laying there is less danger from it than is commonly supposed. Fat hens are not necessarily poor layers, nor are lean ones good layers. The trouble with many non-laying flocks is that they get too little food. A little more food will often turn an egg failure into success.

While it is futile to give an empirical amount, a rough estimate is one pint of grain or its equivalent daily to each four mature laying fowls. Growing stock eat rather more in proportion to weight.

4. **Palatability.** Fowls are observed to be less repelled by



DARK BRAHMA HEN

filth than other domesticated animals. They seem to revel in it and yet palatability of food is as much a factor in their well doing as in that of other live stock. Feed that has been messed over in their troughs and become sour is not eaten with anything like the relish shown towards fresh food. Whole grains have an advantage in keeping fresh and not becoming tainted if left in the coops, while moist mashes deteriorate rapidly and should be eaten up at once when

fed. The wet mash is no longer regarded essential and has been cut out of the feeding scheme of many poultrymen, having been replaced by the hopper system or dry grain and mash. The one advantage of the moist mash lies in its affording opportunity for feeding bone meal or some fine condiment or matter not readily eaten when offered separately.

Vegetables like cabbage or mangolds may be fed cut finely or transfixed on a peg or nail for fowls to peck. Medium size pieces are not satisfactory for they are dragged about the litter and become fouled. Splitting large vegetables permits fowls to get at the heart of the matter.

Cooking feeds, excepting perhaps potatoes, does not improve their palatability nor their nutritive effect.

Cutting and moistening or steaming may make clover or alfalfa go farther and spend better, but where these are so abundant as on Montana ranches the saving will not compensate the labor of preparation.

**Frequency of Feeding.** A wide variety of practice obtains in respect to frequency of feeding. One poultryman feeds five or six times daily; another by means of feed hoppers or other devices feeds once a week or twice a month as the hoppers become empty. Both get first-class results. One feeds a warm mash on cold winter mornings; another gives a warm mash before his birds go to roost. Both are good caretakers and get first-class returns.

It is well to have a feeding system and follow it closely, but what that system is is immaterial so long as fowls are fed with good judgment, a suitable variety of proper foods, in adequate amounts, and are kept dry, clean, and comfortable.

**Convenience and Economy.** An arrangement whereby the labor of properly caring for fowls can be reduced to the minimum is well nigh indispensable to successful poultry keeping. The person who potters about, spending his entire time with one or two hundred hens, may get a high percentage product for that number of birds, but he makes a poor showing beside the man who cares for three thousand, as is possible with proper facilities. The gross income of the latter on a 40 per cent egg product would be ten times as great as that of the farmer on a 60 per cent basis, and the net monthly profit would be as $400 is to $50. The same principle applies to

poultry keeping on the farm. Every reasonable facility for minimizing labor and eliminating drudgery insures better care, increased interest, and greater profit from the flock of poultry on the farm.

**Growing Chicks:** Newly hatched chicks require a day or two to absorb what was the egg yolk and need not be fed for forty-eight hours after leaving the shell. The first feed should be bread and milk, johnny cake and milk, chopped boiled eggs, or something easily digested. It should be moist but not wet. Dry chick feed composed of small seeds, chopped oats, corn, and wheat, with bone charcoal and small grits and a small quantity of fine beef scrap may be fed ad libitum and produce the best growth. Skimmed milk, both sweet and clabbered, is very nourishing and promotes rapid development.

Protect young chicks from chills and especially from wet, but give them abundance of new range and clean dry hovers.

**Separate the Sexes:** It is advisable to separate the cockerels from the pullets as early as the sexes are readily distinguishable, rearing them on different ranges. Much more perfect development may be secured in both sexes by this method. The cockerels are quieter and make better growth and fatten faster when by themselves. The pullets develop faster and begin to lay at an earlier age when allowed to feed peacefully, undisturbed by the attentions of precocious cockerels.

**Egg Production:** All nature seems to feel the stimulating impulse of the opening of spring. Its conditions as regards climate, sunshine, budding vegetation, insect life, and food in great variety are sure to result in the maximum production of eggs. Inasmuch as everyone's hens are laying, the egg supply is enormous and prices are lowest at this season.

By hastening the development of pullets and inducing early fall laying, simulating spring conditions in variety of foods, and sheltering to prevent chills, eggs may be secured at a season when they are scarce and high and thus a very profitable return be obtained. Montana winters are not severe. Snows do not remain long as a rule. The air is dry and bracing. Wet spells are generally delayed until spring. It looks feasible therefore to secure a good egg yield in winter under these conditions. All hens lay in the spring. If, then,

our pullets lay in the fall and winter and in the spring too, they become dividend payers of no mean order.

**Fattening:** With due attention to growth and egg production there is sure to be an adequate degree of fatness for any ordinary requirements. On the range, however, there will be each season a crop of cockerels that may be materially improved by a short period of fattening before sending them to market. Two or three weeks of close confinement in clean quarters on a full ration of palatable feed, soft and rich, will accomplish wonders in the way of producing prime soft roasters for the table. Birds should be sorted out according to size and lots made uniform. They should be prevented from quarreling and over-exercise and fed all they will eat. A good way of penning is to use coops with slatted bottoms through which the droppings fall to the ground, preventing fouling, and through which the legs of the young roosters are sure to slip if they get to scrapping. They soon learn that fighting is not a success on the slat floor and settle down to the business of getting fat.

**Molting** is a trying season for fowls and one that taxes the vitality. Debilitated birds molting in cold weather frequently conclude that life is not worth living and give up the struggle. Early molting is desirable both because of more favorable weather and better range conditions and because vitality is not sapped in the same degree. Fall and winter laying is easier to secure after an early molt.

Molting fowls need a particularly nutritious diet. Plenty of protein secured by liberal meat rations is advisable. It has been determined conclusively that the liberal feeding of flax seed and sunflower seed in late summer makes fowls molt earlier and faster and leaves them in a stronger condition with more vitality than other fowls from the same flock not so fed.

**Winter Warmth:** A common opinion has prevailed that warm quarters are requisite to the production of winter eggs. Air tight houses have been built and even heating systems installed to keep a summer temperature inside throughout the winter season. Where these are not well ventilated, moisture collects on the walls and ceiling and a reeking atmosphere, saturated with exhalations of the flock, enervates and debilitates the hens until laying is out of the question. Slight exposure brings on colds, and other disorders fol-

low until the plant becomes a failure so far as winter laying is concerned.

Recent experience leads to the conclusion that hardiness is a valuable asset in egg production. An open shed or loosely constructed house, airy but not drafty, seems best. Fowls gradually become inured to cold with the increasing rigor of winter and it does not injure them. If it is desired to close their quarters in storms or extreme cold a canvas or burlap shutter serves to exclude the weather and yet preserves a dry atmosphere inside without drafts.

It gives laying hens a set back to have their combs freeze on cold winter nights, and to prevent this a small snug roosting compartment may be made with a drop curtain which will hold the heat given off by the birds perching close together and yet filter the exhalations out and the fresh air in. In this way protection from frost bite is afforded without pampering or reducing the hardiness of the birds.

Better egg yields have been secured with hens in curtain front houses in cold weather than in warmer houses with abundance of glass windows. Dryness and pure air is far more important than winter warmth.

**Feed Hoppers.** Many poultry keepers are using food hoppers which hold a supply for a week or more, thus reducing the labor in feeding. I know one man who cares for 3000 White Leghorn hens alone. There is a stream of pure water on the range near the poultry houses. He spreads a ton of oyster shells on the range about once a year and puts a wagon load of feed at a time into the hoppers. The hoppers are scattered through the houses according to the number of birds, each set comprising one for whole grain, one for meat scrap, one for grit, and one for charcoal. The same system is becoming very popular among business poultrymen.

On the farm or ranch a hopper of grain, one of beef scraps, and one of grit, accessible to the fowls at all times, will make the labor of attendance next to nothing.

**Dry Mash Feeding.** A somewhat new feeding system has come into vogue under this designation. A trough with slatted sides and a cover to keep fowls out, just allowing their heads inside, is kept before the fowls, filled constantly with dry ground feed mixed so as to furnish all the necessary materials. They do not relish this like

whole grain, hence do not gorge upon it. On the other hand, they are never hungry but go very often and pick out a few mouthfuls of feed. Splendid results have been secured by this system and many poultry keepers are enthusiastic over it.

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**Dry Mash Feeding** A somewhat new feeding system has come into vogue under this designation. A trough with slatted sides and a cover to keep the fowls out, just allowing their heads inside, is kept before the fowls, filled constantly with dry ground feed mixed so as to furnish all the necessary materials. They do not relish this like the whole grain, hence do not gorge upon it. On the other hand, they are never hungry but go very often and pick out a few mouthfuls of feed. Splendid results have been secured by this system and many poultry keepers are enthusiastic over it.

A modification or supplement to it consists of feeding whole grain in the scratching litter or on the range in moderate supply. They like whole grain better, eat it greedily and will scratch and exercise hard to get it. Giving them less whole grain than they want makes them hustle to get what there is of it and then eat enough of the dry mash to satisfy the appetite.

**Cramming.** For a finish and fancy market quality, cockerels or capons may be forced for a short period prior to dressing by a process known as cramming. The birds are confined for a week before beginning the process and fed all they will eat from troughs. Then they are placed in cool airy coops, not too light, with slatted floors and sides, four or five birds to the coop. The coops are arranged in rows easily accessible, with sliding doors to enable the attendant to catch the birds easily.

By means of a machine consisting of feed tank, a piston and a half inch tube which is inserted into the crop, soft food is forced into the crops of the birds.

A mixture of finely ground corn, barley, wheat middlings, oat meal, and animal meal mixed with skim milk to the consistency of thick porridge is used in cramming. Birds are crammed twice a day for about three weeks when they are ready for market.

If the birds go off feed they are given a teaspoonful of epsom salts and turned out on a grass range.

An expert with an attendant to catch and return the birds will cram three hundred and fifty in an hour.

# CHAPTER VIII.

## PROFITABLE EGG PRODUCTION

By A. F. HUNTER

Associate Editor, American Poultry Advocate, Syracuse, N. Y.

Eggs are the foundation of all profit from poultry, and the end and aim of keeping poultry is profit. Eggs of themselves are a cash commodity, always and everywhere, and if we wish to grow market poultry we must have eggs from which to hatch the chicks. It is perfectly evident, then, that eggs are the foundation of all our profit from keeping poultry.

Eggs are high in price in late fall and early winter, the price gradually falling away because of the greater quantities of eggs laid as the natural producing season approaches, until the lowest price is reached in April and May; from that time the price rises again until high tide is reached, in November. It is, then, the late fall and early winter eggs that bring the best prices and pay the creamy profits, and it is essential that we study the conditions which favor the production of late fall and winter eggs if we would have those creamy profits.

The production of eggs is a natural function of fowls; it is a step in nature's provision for the reproduction of the species. In a state of nature the egg-producing season was in the spring of the year, the "natural" time of production of the young, but centuries of domestication have effected an evolution, so that it is now the natural disposition of the fowl to produce eggs as soon as the period of maturity is reached, from which it is easy to see that to produce eggs at the time when they pay the best profits, it is necessary to have the pullets fully matured before cold weather comes upon them.

It is conceded by all observing poultrymen that it is the pullets that do almost all of the late fall and early winter laying, hence it is obvious that we must provide flocks of fully matured pullets if we want the very best profit. It is equally well understood by experienced poultrymen that to be good layers in late fall and through the winter, the pullets must have been early hatched, that

they must have been kept steadily growing so that they come to full maturity before the cold weather of winter overtakes them, and then that they be kept steadily laying by good food and good care. So firmly are we convinced of the truth of this preachment that we have frequently published the opinion that the key-note to the best profit from our poultry work may be stated in the following three short rules:

First: Hatch the chickens early.

Second: Keep them steadily growing so that the pullets shall be fully matured and begin laying before cold, freezing weather.

Third: Keep them steadily laying by good food and good care.

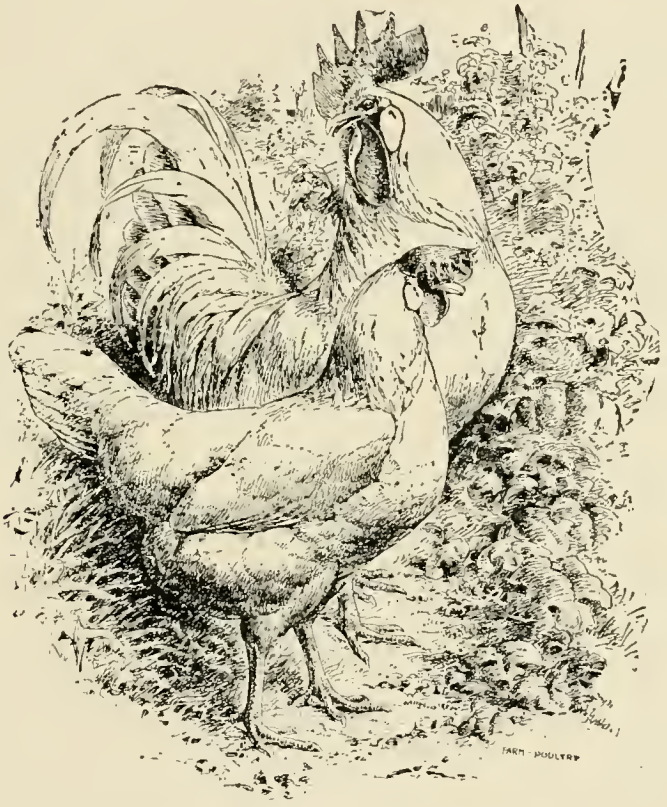
The whole philosophy of profitable egg production is stated in those short rules, the whole story consists in consideration of the details of those rules.

In hatching the chickens early we should avoid the error of hatching them too early, because the too-early-hatched pullet is hurried into pre-maturity by the effort which nature makes to reproduce the same season; we have seen a Plymouth Rock pullet which was hatched early in February, begin laying at four months and two days old, and hatch out a litter of chicks from eggs of her own laying two or three days before she was six months old. Needless to state that she was very small, and as a profit producer comparatively worthless. Pullets from the too-early-hatched flocks will come to laying in mid-summer, will lay two or three dozen very small and undesirable eggs, then will molt and thereafter be as sluggish layers as old fowls.

The best time for hatching the chicks from which the best layers are to be grown is the first half of April for those of the American classes,—the Plymouth Rocks, Wyandottes and Rhode Island Reds, and the first half of May for the Mediterranean breeds,—the Leghorns and Minorcas. Hatched at those times and kept steadily growing they should attain full maturity in October and begin laying, so that by the middle of November they should have settled into their regular gait, and be steadily producing good, marketable eggs.

To attain that most desirable goal the second rule must be carefully observed, the chicks must be kept steadily growing. It amounts to a truism that a steady growth is the best growth, and that chicks which have been kept steadily growing come to the

functions of maturity best equipped for performing the duties of fowl life. Nor is it at all difficult to keep them growing if we observe the simple rules of chick-life, which are,—good food, clean, comfortable quarters, and liberty to range freely. It ought not to be overlooked, however, that it is an essential of good growth that the chicks be well endowed with strength and vigor, and that strength and vigor is obtained only from the parent stock; this very essential constitutional vigor cannot be put into the chick after it



SINGLE COMB WHITE LEGHORNS

is hatched, it must be in the egg, therefore must be in the parent stock which produced the egg.

It is worthy of note, too, that there must be abundant strength and vigor in the laying stock if it is to do really great laying. The point is well brought out in bulletins of the Maine Experiment Station, where notably good work has been done in developing the laying traits. In one of those bulletins the statement is made:

"Every hen that has laid large numbers of eggs through the first two years, has shown much vigor and constitution."

There is a large nugget of poultry wisdom in that brief sentence, and future profits for us if we learn the lesson of it. It is too late, now, to build up the strength and vigor of the breeding stock we have used this season, but not too late to begin to prepare for an abundance of it in next season's breeding. An important aid to this is to carefully cull out and kill off every chick that evidences lack of vigor and snap. That lack is easy to detect in the chick and once it has shown itself put the chick out of the way,—then there is no danger whatever that it will get into the laying-breeding pen. Upon this point a short exhortation by Prof. James E. Rice, of Cornell University, is worth heeding. It is:

"One decided aid to better vitality in the flock is to never let a chick live that shows low vitality; 'kill every weakling' should be the wide-awake poultryman's watchword, and never breed from a bird that is not just 'full' of vigor and vitality,—that is not in the most robust health. The indications of weakness and low vitality need to be considered, the condition of the eye being one of the safest guides; a dull, lusterless eye is a certain sign of weak vitality. A long, thin shank and thin body is another indication of weakness, and we should avoid a 'crow'head, a long thin head—that is a sure sign of lack of vitality and vigor."

The modern methods of feeding chicks make their continuous growth a simple matter. The prepared chick-foods are excellently planned to produce this result, and as they greatly lighten the labor of growing the youngsters it is not surprising that they are generally used by poultry growers. The first two weeks of the chick's life is the critical time, and during those first weeks the feeding is done three or four times a day; after that time two kinds of food are kept before them, in food hoppers, and they help themselves as appetite prompts.

A dry-mash mixture, or "Growing Food," is in one hopper, cracked and whole grains, mixed, in the other hopper, and beyond watering the chicks once a day, shutting up the coops at night and opening them in the morning, (to secure them against strolling varmints at night), there is little to do.

There are a dozen good dry-mash mixtures on the market, and a good home-made mixture, where there is sufficient variety of feeds, is made by mixing 200 lbs. good wheat bran, 100 lbs. wheat middlings, 100 lbs. corn meal, 100 lbs. gluten meal (or brewers' grains),

100 lbs. fine beef scrap. (This, of course, can be mixed in units of ten instead of a hundred.) The hard grain may be 200 lbs. fine cracked corn, 100 lbs. cracked wheat, 100 lbs. coarse oat meal, 50 lbs. millet seed. After the youngsters are two months old the hard grain mixture should be changed to cracked corn, wheat, good-quality oats, with a small proportion of barley and buckwheat added. Grit, charcoal, fine oyster shells, and cracked bone should be accessible to them at all times. It goes without saying that there should be clean, fresh water by them all the time.

Cleanness of brooders and coops is essential; nothing discourages growth like having to sleep in quarters reeking with filth, and most probably swarming with vermin. The brooders should be cleaned once a week at first, twice a week after the first three weeks, and when the chicks are moved out into colony coops, on range, once-a-week cleaning is ample if the coops are roomy, (three by six feet on the ground and three feet high in front), and if a wheelbarrow of fresh loam is put in at the cleaning. Our method is to go to the coop with the wheel barrow, shovel out all the loam into the barrow, dump the loam in the garden and load with fresh loam; in this way the coops are kept clean and fresh, and the garden receives the droppings, which the scratching of the chicks has mixed into the loam in the coop.

On the above rations with such care we have no difficulty in getting Plymouth Rock pullets to laying at five and a half to six months old; last season we found the first egg the tenth of September, five months and eleven days from taking the chicks from the incubator; by the middle of October they were about all laying, and we sold off to market the sluggish growers, that were evidently lacking in vigor and strength.

We believe it is a blunder to "force" the pullets into pre-maturity, and bring them to laying before they are fully grown and have attained that full maturity normally. It is easy to push them along, and when the hatches are late there is strong temptation to push them; it is always at the cost of weakening them, however, as all "forcing" tends to make them soft and weak, and especially susceptible to diseases.

After the pullets are moved into the winter (or laying) quarters the method of feeding may be quite as simple and easy, with the exception that it is desirable to stimulate exercise by throwing

them two feeds a day of a mixture of whole and cracked grain, which if scattered in litter, will keep them busy till the last kernel is found and eaten.

A good and simple scratching food is made by mixing together four quarts of screened cracked corn, two quarts of wheat and two quarts of oats,— or mixing in that proportion; eight quarts is sufficient for 100 hens one day. Some prefer to feed the wheat and oats in the morning and the cracked corn in mid-afternoon, others

WHITE CRESTED BLACK POLISH

to mix all the grains together and feed about half in the morning and the balance in the mid-afternoon.

The base of the ration is the dry-mash mixture, of ground grains and beef scrap, which is in a food hopper hanging against the wall of the pen, and is accessible at all times. Good dry-mash mixtures

are supplied by dealers in poultry supplies, or can be mixed at home if one has a variety of meals at hand. An excellent dry-mash is that given above for the growing pullets.

A very great advantage of the dry-mash method of feeding is that the birds will not overeat of it; they seem to prefer the whole and cracked grains thrown them in the scratching food, and so long as they can find any kernels of that to reward their scratching and searching will not eat the dry mash. They eat of that, however, to satisfy the craving for animal and vegetable protein, and after they have secured the last kernel of grain will be noticed at the food hopper, filling up on the dry mash for the night.

Another advantage is that the dry mash acts as a safety valve, permitting our increasing speed or reducing it, by slightly increasing or decreasing the amount of scrap and gluten meal. The condition of the droppings should be our guide. If there is any tendency to softness of the droppings we are feeding close up to the danger line, and should slightly reduce the amount of scrap and gluten meal in the mash, or can slightly increase the quantity of scratching food fed, which will induce eating a smaller quantity of the mash.

Egg-production is a large subject to concentrate into small space; a volume could profitably be given it. In this small space we have endeavored to give the essence of profitable egg-production, have tried to point the road to the best profits in poultry work. When all has been said, however, it is evident that the key-note to egg production lies in the three brief rules given above; those rules clearly and steadily point the pathway to profit from poultry, and if we steadily, persistently follow that pathway our profits are assured.

## CHAPTER IX.

## MARKET POULTRY.

By PROF. CHAS. K. GRAHAM
Hampton Normal and Industrial Institute, Va.

A few years ago, especially in the West, Poultry was considered a by-product of the farm, and in many cases, merely a necessary evil, permitted to exist about the barn for the gratification of the farmer's wife or children.

However, as time advances and competition becomes keener, people read and think more than formerly, with the result that little things, even though they be hens or eggs are not so often despised, and today in most of our Agricultural Colleges and Experiment Stations, the hen and her products are receiving as much attention as the cow, sheep or hog.

It was only three or four years ago that in the eyes of the average dealer, all chickens looked alike, the only difference being the possibility of age. Today, however, the housewife and chef are beginning to notice that care is as necessary in the selection of a fowl as in a piece of beef, i. e., they are beginning to realize there is as much difference in the many varieties and types of fowls as there is in different types or breeds of cattle or of hogs.

Some breeds are noted for egg-production, while others have a tendency to put on much flesh; some breeds are noted for the firm texture of their flesh and large percentage of white meat, while others are coarse boned, carrying abundance of dark meat. However, be the meat light or dark, the fowl old or young, a great deal can be done to make the chicken not only much more sightly, but the flesh much more palatable. With chickens as with everything else, the attractiveness of the bird greatly adds to its value, i. e., the eye assists the palate.

When a commission merchant opens a case of fowls, they will naturally become conspicuous if they are of an even size, carefully packed, showing either all breasts or all backs, or alternating—any way—only put up in such a manner that they show care, thereby giving the prospective buyer a hint that they are considered worth packing carefully, and therefore of extra value. Of course, attract-

ive packing is not the only difference between good and poor goods, but it is the first conspicuous sign.

If market poultry is desired, two things should be considered. First, to have only one variety or type of fowl, so that there will be a uniformity of type when the parcel is opened. Second, to have at the head of the flock a male, with all the characteristics that you wish conspicuous in the chicken. He should have plenty of bone in the legs; have a short "bull" neck, broad back and breast, plenty of distance between the legs, so that there may be plenty of room for breast meat; he should have a short, heavy beak, a clean, healthy comb and a bright eye, signifying both ambition and strength. With such a bird at the head of the flock, good stock should be obtained, but much can be done to improve them, both in feeding and dressing. Different markets demand different peculiarities, and of course these must be considered, but there are a few things that all markets demand or are willing to give the preference.

Nearly every person wants white meat, and what may be peculiar, but nevertheless a fact, is that the consumer does not seem at all particular as to the possible size of these slices of white meat, so long as many slices are obtainable. For this reason, it is seldom that the length of the chicken's breast is considered, but it is very important that the carcass be so as to make it appear as broad and as plump as possible. This can be done by "shaping" the chicken immediately it has been plucked. Do not allow the bird to cool or stiffen while hanging, thereby giving it a long, thin appearance, but draw the legs close to the body, being careful that the feet are clean. Place the wings behind the back; the bird should then be put in a trough with the tail down, and a brick laid on its breast, so that it will settle into blocky form, and when removed six or more hours later, it will be noticed that not only the breast but the back will look broad and smooth, and the tail will be less conspicuous, giving the bird a general, round, plump appearance.

The killing and plucking of poultry adds to or detracts from its market value. It is seldom a bird is scalded that the value has not been lowered—i. e., scalding naturally cooks the skin and is easily detected, and after once using dry plucked birds, it is seldom that the average housewife will again accept scalded stock, except at a lower price; but if, when scalding birds, they are taken from the hot water and immediately plunged into cold water, the

cooking of the skin may be slight and the bird may be plucked quite as easily. Dry plucking is a trade in itself; it requires patience and practice to become a successful dry plucker, but after the art has once been mastered, it is seldom the person would again scald; the difference in time required is slight, and the results so much more satisfactory.

Hunters have been quoted as saying "that the deer that had

DORKING

been shot while grazing in the fields made more tender venison than the one that had been chased by hounds, and was killed when heated or excited." This will also be found true with poultry.

There has been considerable agitation in the East during the last five years against shipping undrawn poultry. However, if the

birds have been properly starved—not fed any hard grain for at least eighteen hours, or any mash for twelve hours before killing, the probability is that the intestines will be empty when the bird is killed, and if properly chilled it should keep any reasonable time at the same time improving in flavor, but if the grain is left in the intestines, fermentation will set in and the fowl will spoil quickly. If, however, the bird is opened or drawn, it will soon begin to mould and sour when the air reaches the interior. All fowls should be carefully cooled before putting in packages. By cooling it is not necessary to chill it, but see that the animal heat has left the body; otherwise, it is likely to spoil about the thighs or wings, or wherever it may touch another bird.

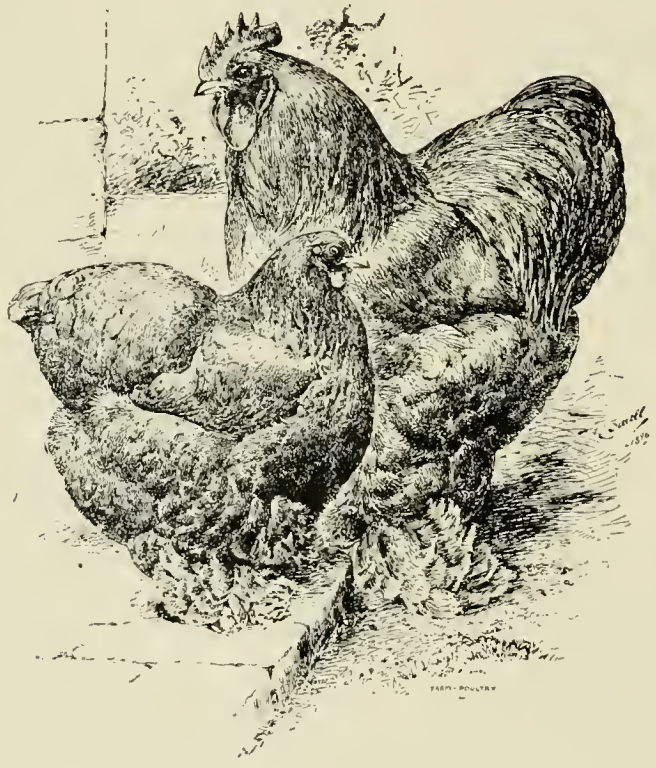
In the East during warm weather, a great many birds are shipped alive in crates. The greatest objection to this method is the very heavy shrinking in weight. This can be avoided to some extent by feeding a mash about ten hours before the expected delivery of the fowl at its destination. If they are on the road longer than twelve hours, some shrinkage must be expected, but a feed of corn instead of mash will give results. Of course if the birds are fed later than the hours mentioned, the purchaser is almost sure to detect grain in the crop and deduct more than the shrinkage would amount to.

The feeding of the bird for market deserves much attention. Any person can sell or produce ordinary poultry, but what applies to other products applies to poultry. The consumer will always give the best article the preference, and in most cases, the better the article, the smaller the competition and the greater the profit. There are decided differences in people's tastes, and we must take these into consideration. Many people like a white skinned fowl, while some would not buy a bird unless it was golden yellow. While it must be admitted that all poor fowls have white or blue skins, still it is possible to get a fat bird with a soft, thin white skin, by feeding plenty of milk, ground oats, low grade flour, and avoiding very much corn. The corn should be increased and the oats decreased if a yellow skin is desired. Milk has a tendency to whiten the skin, but if a nice, juicy flesh is desired, the bird should be fed a milk mash for at least a week or so, or longer if it will continue to eat heartily—being careful to kill as soon as it begins to desert its food. With cattle, stall feeding used to be encouraged. Today, we

advise limited range. The same with poultry. If the birds are stall (crate) fed, great care must be taken or they will lose their appetite from lack of exercise; yet we advocate scratching litter for laying hens to work the fat off, but I like a limited range. Let the birds be comfortable; give them a small yard and a clean room when they are fattening, and they will take the necessary exercise, but are not likely to overwork.

While the milk gives a more juicy flesh, a little cider vinegar, one tea cup full to two gallons of mash, will make the mash more easily digested, and give the flesh a little flavor or finish that is appreciated, and yet is not conspicuous.

To the person who sells to the consumer, let me give this last



BUFF COCHINS

suggestion. When drawing a bird, do not open or cut the skin at the crop, but insert the point of a knife in the back even with the wings; run it down the back of the neck as far as the head. This exposes the neck bone, which should be severed from the back; a white spot or cord at the junction of the neck and backbone will be noticed; this marks the place where the separation takes place.

After removing the neck bone and throat lining and wind pipe, the crop can easily be taken out, leaving a long piece of neck skin to wrap over the opening. This may be used to hold the dressing, and at the same time make a much more presentable fowl for the table.

## CHAPTER X.

## CAPONS AND CAPONIZING.

By WILLIAM F. SCHOPPE

In some localities caponizing is carried on quite extensively and to the poultry man who desires to dispose of his surplus cockerels as roasters it offers great advantages. As soon as the cockerels have been separated from the pullets and placed in pens by themselves, preparatory to the final feeding (about the eighth or twelfth week), they can be caponized. The direct effect upon the birds is that they lose their male characteristics. The comb and spurs cease growing, the voice is changed, and the birds lose their desire to fight and roam about, preferring to remain quiet and rest, thereby putting on flesh rather than developing energy and strengthening muscles. In consequence the flesh remains tender, is of a much finer texture and of better flavor. It is claimed that birds grow considerably larger when caponized and that they make larger gains from the food given them. This is probably due to their more quiet nature and their desire to stay near home, rather than to any direct effect that the operation has upon them.

### CAPONIZING.

Thirty-six to forty-eight hours before the day set to caponize the birds, they should be caught and placed in clean coops or crates and given no food or water till after the operation. It is absolutely necessary that the intestines be well emptied so that they will lie back out of the way and make it easy to reach the testicles.

For an operation table get a box or barrel, something that is easy to move about, yet solid and not easily shaken. If the operator prefers, he can make a more substantial table, and one especially adapted to his work. Such a table as is used here at the station is very cheaply and easily made. It consists of three legs, three feet six inches long, fastened into a top piece that is eight inches in diameter. In the bottom end of each leg is a brad to prevent it from slipping. Through the center of the top piece is an inch hole into which fits an upright clamp. The top of the table, which is eighteen inches square, is fastened into the clamp upright

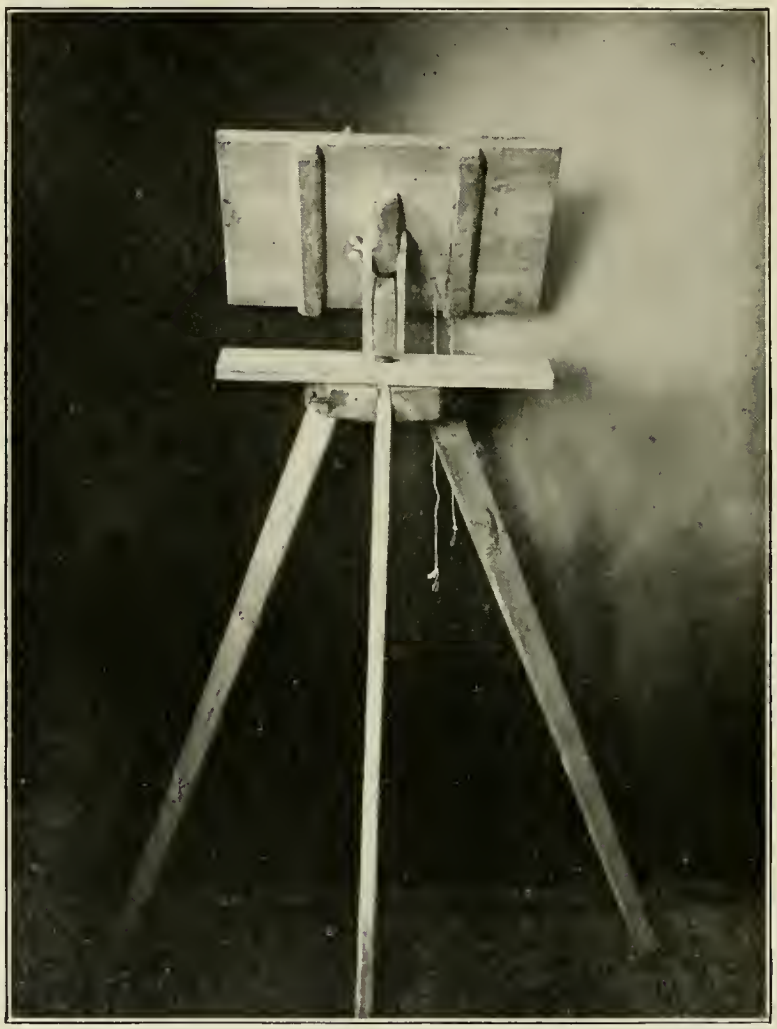
so that it can be easily moved up and down and held at any angle. The lower end of the clamp upright is round and this permits the table to be turned easily to the side. A shelf is placed between the

READY FOR OPERATION

base of the tripod and the top of the table. Such a table is very convenient and has many advantages over the box or barrel. The bird can be easily turned at any angle to allow the sun to shine

through the cut and enable the operator to see what he is doing, which is very essential, especially to beginners.

To fasten the bird to the table, place it on its left side with its wings drawn together over the back. Pass the cord around the base of the wing and drop the weighted end of the cord over the edge of the table. Then wrap the cord twice around the legs, above the knee joint, taking care to get the top leg drawn back farther than the under one; drop the weight over the edge of the table and the bird

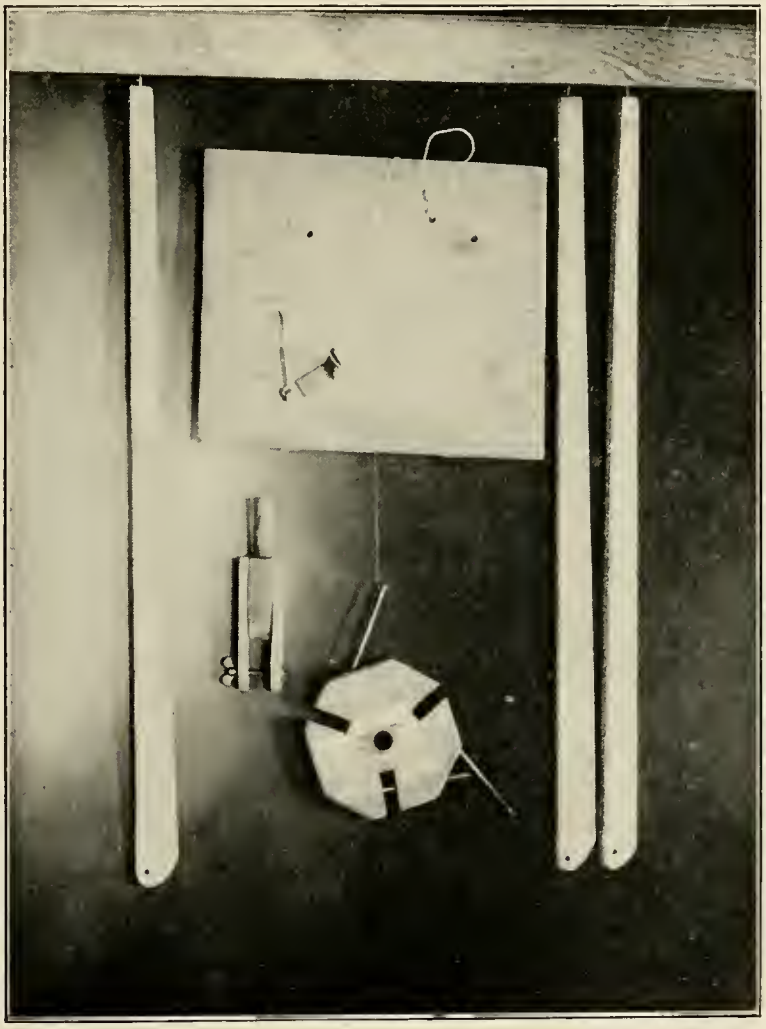


CAPONIZING STAND.

is securely fastened. If desired, an iron upright with notches in one edge into which a lever fits can be used to hold the wings.

Next wet the feathers with cold water. This will help to stop the flow of blood and also keep the feathers out of the way, and

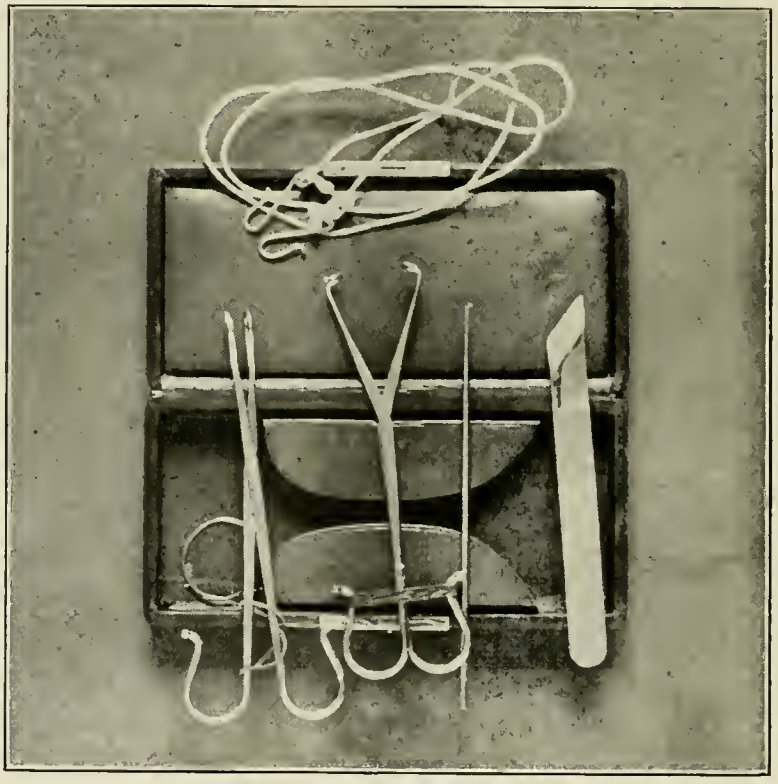
thereby leave the skin exposed. Should any feathers appear to be in the way they should be pulled out. With the fingers of the left hand draw the skin and flesh back towards the hip, care being taken to get the muscle that controls the right leg out of the way, for if it is cut it will cause lameness. Take the knife in the right hand and make an incision one to one and one-half inches long be-



DETAILS OF CAPONIZING STAND

tween the first and second ribs. Be careful to follow direction of the rib and not cut it off. This cut should be made with one slash of the knife clear through the skin and flesh, leaving the intestines exposed. Insert the spreaders and hold them in place with the left hand. If the hole does not appear large enough cut up towards the back, taking care not to injure the kidney. With the needle

hook tear a hole through the membrane. This will expose one testicle. The other lies just below it. Now take the forceps, reach down beyond the upper testicle and work the lower one up into sight, catching it with the loop of the forceps. Twist it around once and draw it out. Then remove the upper one in the same manner. Care should be taken not to injure the artery which runs between the testicles, as such injury might be fatal. Remove the spreaders. The skin will slide back over the hole between the ribs and prevent dirt from getting inside the bird. Release the bird in the pen in which it is to be kept, and feed and water as before



CAPONIZING INSTRUMENTS

the fasting period. In a day or two the wound will heal, and in one or two weeks it will be almost impossible to tell that the bird has been caponized. It is well to watch the birds for a day or two to see that a wind puff does not form under the skin. Should this happen cut through the skin and work all the air out.

It is absolutely necessary that all of the testicle be removed, otherwise the operation will do no good, as the remaining part will grow quite large. Such birds are known as slips. They are

great nuisances, as they are constantly chasing the hens. Slips grow nearly as large as capons and are not easily told from full capons.

## POULARDS.

These are pullets which have been caponized. The operation is very similar to that used with the male, except that a portion of the oviduct is removed. The caponizing of pullets is not generally practiced as there is no very great benefit derived from it.

It is well for the beginner to practice upon one or two dead birds. By so doing he becomes accustomed to handling the tools and learns where to make the cut and locate the testicles.

The operation is not very painful and after a little practice the operator becomes accustomed to making the cut so that only one slash of the knife is necessary, thus reducing the pain to the minimum. The time required for the operation is about one minute. As soon as the bird is relieved it will commence eating, showing that the operation did not spoil its appetite.

## PREPARING FOR MARKET.

In some markets capons command a premium over cockerels and for that reason the distinguishing marks are left. The head is one distinctive feature of the capon; it is long and pointed and therefore should be left on, and the bird should be killed by bleeding. The neck and saddle feathers of capons are unusually large and fine. These and the small size of the tail distinguish them from other fowls; therefore they are left on together with the feathers on the leg from the hock joint half way up the thigh, and those on the outer joints of the wings. The breast, back, the wings next to the body and the upper part of the thighs are picked clean. They should be picked dry, care being taken not to tear the skin. All blood should be washed from the head and mouth and the feet should be washed before sending to market.

## CHAPTER XI.

## PREPARING FOWLS FOR EXHIBITION.

By C. S. NORTON

In developing exhibition birds, the fancier should bear in mind that, in order to have his birds in the best possible condition for the show, they must be in perfect health, or plumage will be imperfect in color and shape, and the specimen, though it may carry an abundance of flesh and be up to the standard weight, will be sluggish and inactive, really unfit to be seen on exhibition. We always expect to have the plumage on such birds at its best in regard to maturity of feathers and condition of same. I will endeavor in as few words as possible to explain how these conditions may be attained.

Fowls that are in good physical condition usually molt well, but certain foods are required to assist in bringing out the plumage in its best form, so that it will have the required luster. During the molting period we prefer to give fowls foods of an oily nature. These assist materially in bringing on the molt of the old feathers and also in promoting the growth of the new. A little oil meal mixed in the mash at this time will be found one of the best and perhaps the most economical component the fancier can procure.

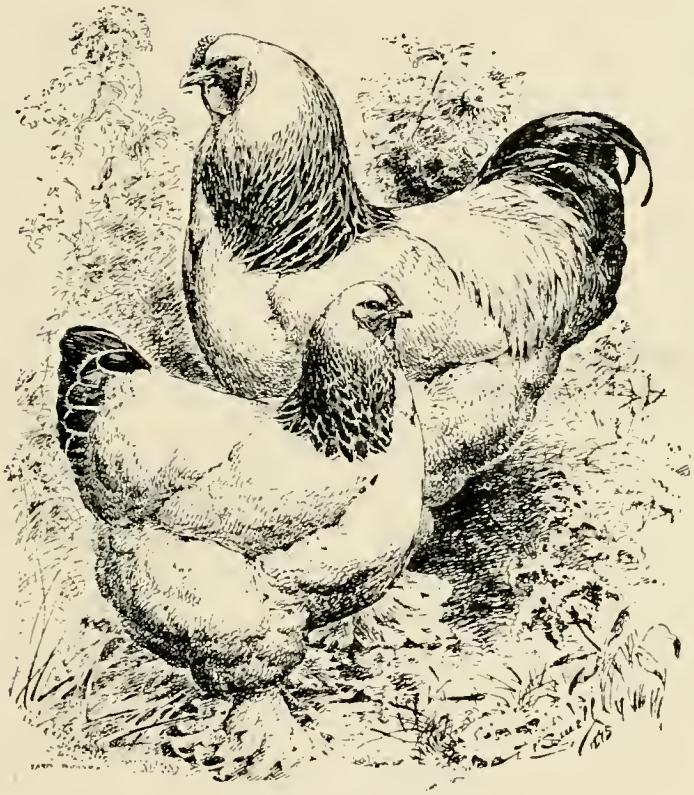
Birds intended for exhibition, when confined in close quarters, should be fed liberally on a variety of grains, the same to be thrown in clean litter of some sort to keep them as active as possible in finding it. This develops typical shape and firmness of feathers, gives them the bright red combs and brilliant eyes, and puts their digestive organs in good condition to stand the one week of heavy feeding that they are to receive while on exhibition. We seldom find a superintendent or attendant who underfeeds. They could not if they wished, for some exhibitors are always on hand to accuse them of starving their chickens; consequently the result is overfeeding from the first to the last day of the show.

I have found many birds on exhibition whose owners have been overzealous in getting them up to the standard weight; such fowls become thoroughly fattened and sluggish and stand a poor show to win first place in strong competition.

But let us not get the idea that an undersized specimen will

stand a better show, for we must have them standard weight or near that point, to get them to score high enough to win. In short, the best marked specimens, that are near standard size, in good moderate flesh, have extraordinary constitutional soundness, and have been trained to meet the visitors at the front of the coop, are the ones that are worth exhibiting.

A few words along the line of training will perhaps help the amateur. We prefer one continuous row of slatted coops, arranged in some well lighted and pleasant room, and place at convenient height from the floor, say three and one-half or four feet. Use



LIGHT BRAHMAS

plenty of clean cut straw or leaves for litter in coops; if possible have enough of these coops to accomodate birds without crowding. Select twice as many birds for training as you intend to exhibit, in order that you may have enough to choose from. About two weeks before the first show you intend to make, put your fowls in these coops for training. For the first few days feed rather sparingly, in order to get them anxious to meet you at front of coop; allow them to eat from your hand, talking to them all the while, and don't be afraid to make plenty of noise around them, for they will get a var-

iety of sounds to excite them during their stay in the exhibition room.

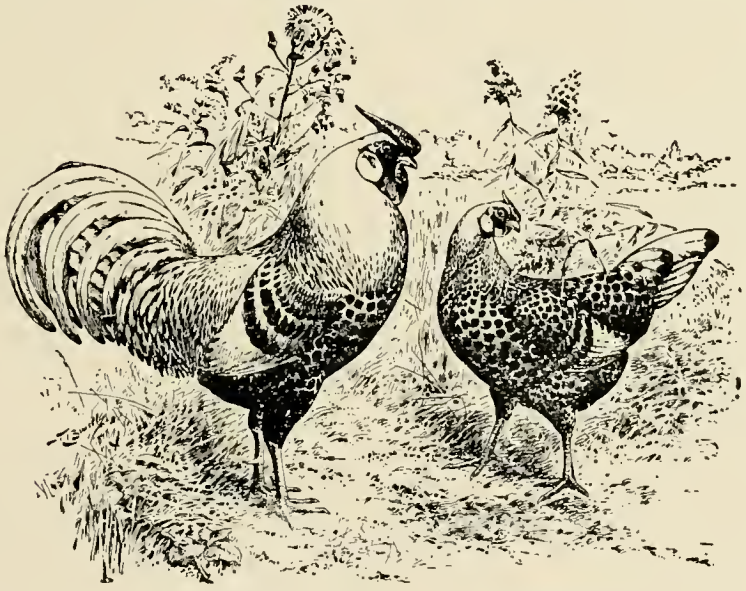
Some of these things may not seem important to inexperienced exhibitors, but when they learn that the loss in points, in carriage, breast, back and tail have caused many a good bird to lose the blue ribbon, that with proper training would have easily won, then they will realize the importance of getting the birds familiar with being cooped and handled. When placing them in coops they should be examined for lice and if any are found, the fowls should be thoroughly dusted with some good brand of lice powder. We recommend putting them in the coops in the evening and removing them to their regular quarters the following evening, thus giving them twenty-four hours in coop and twenty-four hours in regular quarters. This handling every evening will be worth all the time it takes, however weary the task may seem.

Four days before they are to be shipped for the show, examine their plumage and unless the same is found to be perfectly clean they should be washed. This may be done by the following plan. Take three tubs of water and fill tub number one with water at a temperature of about ninety degrees in which you have dissolved one-fourth cake of Ivory soap to every six gallons of water, and thoroughly wash the feathers down to the skin as quickly as possible; but be sure to take time to get every particle of soil from the plumage and see that the skin is perfectly clean. Now you are ready for tub number two, with water at the temperature of about sixty degrees. Stand the bird in this and thoroughly rinse until every particle of soap is removed. Now you are ready for tub number three, with water at the temperature of fifty degrees, with nothing added except in the case of white fowls, when bluing is used the same as for bluing clothes. Stand the bird in this and proceed to give the last rinding. After this is well done, remove as much water from feathers as is possible with hands (never use cloth or sponge in this last rinsing. After this is well done, remove as much water from feath-the body as is possible until you reach the tail and fluff, then squeeze out water.

Now place in coop where temperature will be from seventy to eighty degrees, just warm enough so that the fowls will not chill. They will now take care of themselves, and plume each feather carefully, without any other attention. The temperature of the room

must be kept right; under no circumstances should it become too warm. Unless they have sufficient time to plume themselves while drying, the feathers will not resume their natural position; the back and tail feathers will have a pinched appearance that is unsightly. It is far better to exhibit birds that are just a little soiled than to do a poor job of washing them. It might be well for the beginner to practice washing a few birds before undertaking the ones intended for exhibition.

However unimportant the above mentioned preparation of fowls may seem, we have always noticed that the most successful exhibitors are those who take pains in getting their birds in the pink of condition. The extra work that they have done in caring for their fowls seems to create the sort of enthusiasm that does not die out easily. I am certain that the great poultry industry of this time with



SILVER SPANGLED HAMBURGS

the many new, beautiful, and valuable varieties and breeds, is indebted to the fanciers and breeders who have with untiring efforts prepared and exhibited birds in their well groomed and perfect condition.

In bringing them before the public they have created in the minds of many people a desire to raise a few fowls. Some of these people have become great fanciers and poultry breeders. And in bringing near to perfection the different varieties of fowls, those who have not been exhibiting them may wish for information on judging and selecting the birds to show.

In this article it will be impossible to take up the different breeds and describe the standard points that are required in an exhibition specimen. **The American Standard of Perfection,** a book of about three hundred pages, published by the American Poultry Association, which can be purchased from any poultry paper publishing company for $1.50 fully describes the standard fowls better than any one man can. For this is a book carefully prepared by poultry experts, who have bred and exhibited the different breeds of birds for years, and have become well informed on perfect type and color. In this they have fixed perfect models to guide us in our efforts to produce beautiful and useful fowls.

## CHAPTER XII.

## THE DECIMAL SYSTEM IN JUDGING ALL FARM STOCK.

By I. K. FELCH—Natick, Massachusetts.

Is there any other system so well understood, by man, woman, or child, as the cents, dimes and dollars of our national finance, per-cent, discount and interest? It enters into all the interests of life and is understood by even the illiterate. Could we do any better than employ these rules of arithmetic in discriminating the different degrees of merit, as we adjudicate the premiums in our exhibitions or describe the points of merit in the specimen at home.

The above has been the monetary system of our nation until it has become ingrained into every-day-life. Its scope is better understood than all other systems, having simplicity and effective force. A single rule or score card that secures the same mode of applying all standards, is the one to secure strict justice and equity for each as well as for all.

A multiplicity of scales of points destroys the equity and chances for different breeds or species to compete for sweepstake prizes. But when all standards are applied to one scale of points, like that in the Decimal Score Card, then it will matter not whether the breeds and varieties be horses, cattle, hares, dogs or fowls, for superior merit will win the prize and will score the maximum in points.

It matters not in how many sections the specimen or variety is described, we have only to consider that which comes under one tenth of the organism of our score card. The labor becomes one of detail; we consider but the one section at the time. To illustrate my point and disclose the absolute necessity that it should be the same in value in all breeds, we will analyze the different scales of points formed in the standard for poultry as found in its different divisions, to wit:—

In the American Division, there are:—35 points for shape and 41 for color.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Asiatic Division | = | 33 | points | for | shape, | 39 | points | for | color |
| English " | = | 36 | " | " | " | 31 | " | " | " |
| Polish " | = | 36 | " | " | " | 41 | " | " | " |
| French " | = | 41 | " | " | " | 45 | " | " | " |
| Hamburg " | = | 32 | " | " | " | 35 | " | " | " |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Games | Division | = 54 | points | for | shape, | 36 | points | for | color |
| Silkies | " | = 33 | " | " | " | 26 | " | " | " |
| Sultans | " | = 29 | " | " | " | 31 | " | " | " |

In the decimal system, we consider shape and color as of equal importance and employ the decimal score card for each and all ani-

COCK-O-THE-WALK

mals of the farm. It has 35 points for shape and 35 for color.

You will agree with me that the applying of any standard should secure to all equity and justice. The standard demands where by comparison, we declare a tie, or that specimens are

declared of equal merit, they shall be scored by each breed's scale of points.

Now you run up against this proposition:

The best shaped specimens of all breeds competing:—Plymouth Rock, Brahma, Dorking, Polish, Hamburg, Houdan, Game, Silkie and Sultan, has been declared that, if so equal in merit, the Judge may say they are within 10 % of being perfect in shape. But apply their several standards, by cutting their shape 10 % and find the following results:—

| | |
|---|---|
| Plymouth Rock ..... | 10 % of 35 = 3 1-2 points |
| Brahma ... ..... | 10 % of 33 = 3 3-10 " |
| Dorking ..... | 10 % of 36 = 3 6-10 " |
| Hamburg ..... | 10 % of 32 = 3 1-5 " |
| Polish... .. ..... | 10 % of 36 = 3 6-10 " |
| Silkie ..... | 10 % of 33 = 3 3-10 " |
| Houdan ..... .... ..... | 10 % of 41 = 4 1-10 " |
| Sultan ..... ..... | 10 % of 29 = 2 9-10 " |

To be astonished at results, to find that the Sultan hen wins first place, varying in discount of 2 9-10 points; The Hamburg wins second place, by a discount of 3 1-5 points; The Brahma and Silkie only for 3 and 4 at 3 3-10 points; The Plymouth Rock secures 5th place at 3½ points; Dorkings and Polish 6th and 7th places at 3 3-5 points; while our lordly Game secures the booby prize, being cut 4 1-10, all of which has made all work with the judgment that declared the specimens of equal merit, and condemns the work of the standard makers in their multiplicity of rules, to apply the deserted standards. But let us try this experiment on color. You will agree with me if these same breeds were equally faulty, that they should receive an equal cut in points of merit, but do they? We say all are fully 10%.

The Silkie wins first place by receiving of 10% upon 26=2 3-5.

Dorkings secure second place of 10% upon 31=3 1-10.

Hamburgs and Games secure third and fourth places upon 36=3 6-10.

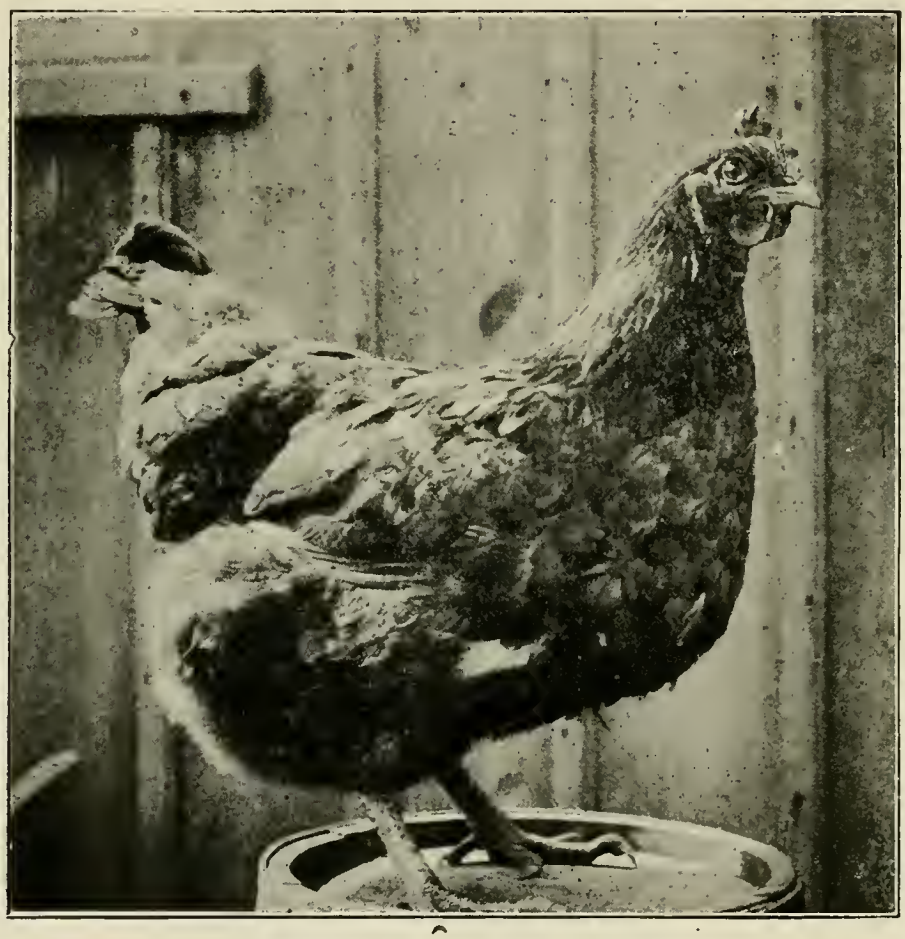
Plymouth Rock secures 5th place upon 41=4 1-10.

The Houdan secures 6th place upon 45=4½.

If all had really been faulty ten per cent, should they not be cut the same—this being true, had they been scored by the Decimal Sys-

tem. They would have all been cut 3½ points for both shape and color, and equity and justice would have been preserved.

Are not the above cogent reasons why all standards should be applied by one single rule and tabulated by one score card for all the breeds. It so simplifies the work that there is no confusion by a judge as he goes from one breed to another in his work at the birth of poultry culture in America. To adjudicate for prizes, we had only to consider four things:—Symmetry as the whole complete, shape



BUFF ORPINGTON HEN

and size, which become compositive; condition, which covers health, disease and cleanliness; color as seen in surface color only, which all together become the sum and substance of all judging. The specimens are rarely taken from the coops. But today we find it another matter entirely. Our artists have endeavored by sketches to give us descriptions of breeds, character and plumage as have been determined and discovered in nature's best specimens. But for all

that nature never makes duplicates. We have then to discriminate the value of that which approaches the ideal description, both for shape and color, awarding the prizes and correct record of merit to the best specimens.

We judge in detail, section by section, cutting whatever defect we find, where located, and the standard description; in no other way can the novice get a full understanding of the work.

The literature of today is largely composed of illustrations, to that extent that the illiterate are able to secure a general knowledge of things. More from them than from the printed words of our standards, illustrations cannot do all the work. The breast and body of a fowl may approximate the general illustration but must be handled to be sure it is full in the quarter and with full keel muscles that gives of that full rounded shape to the breast, and full U shape as felt between thumb and fingers, when handled and when found to be V shape by thumb and fingers coming too near together to be cut as a defect, you see illustrations will never make a complete judge of you. It is intuitive judgment that enables us to discriminate and adjust nature to these illustrations, which we see in the standards and current papers of the day.

Our law for shape must be as found in the best living specimens of the day. Man may demand impossibilities of nature but such acts are foolish. Perfection is a divine attribute, nature can only approximate. Does this specimen come near enough to perfect shape as described to pass as standard perfect?

For the above reason judges are forced to classify certain defects and determine their influence by establishing a discount for them; slightly different shade of color, all of which if even, as a whole plumage, to pass in cut.

A bluish gray barred is a darker blue, a whitish gray barred in dark lines that stop short of black, both of which give a blue tinge to plumage are technically a Plymouth Rock color, and when free from positive white or black, become perfect colored Rocks. The greatest error in all standard making is frequent change of language to describe a specimen. It does not give time for all to settle upon the same interpretation and to breed to the standard demand. All law must be applied with equity. For all standard law was to protect all alike and be just between all breeds and specimens. We cannot be controlled by fad or personal ideality.

What is best in nature of finance?

Are there more notes that sell for 3 and 3½ per cent discount, that in the same proportion, we find farm stock or fowls to score 96 and 96½ to 97 points of excellence.

Poultry and animal judging become like finance and the more completely and accurately controlled by the Decimal System and by use of the Decimal Score Card and the only system that secures equal chance in competition, the better. Bear with me as I formulate the score cards for the different divisions of farm animals, whereby all may compete for the one and same prize, dividing each into ten sections of ten points each.

For Fowls

# The Decimal Score Card

DATE ..... ..... .... ..... ..... .....

BREED ..... ..... .....SEX .....

ENTRY NO. ..... COOP NO. ..... WEIGHT .....

RING NO..... ..... ..... ..

OWNER OR EXHIBITOR



| | | |
|---|---|---|
| CONDITION | | |
| WEIGHT OR SIZE | | |
| COMB, OR CREST and COMB | | |
| HEAD AND ADJUNCTS | Beak<br>Eye<br>Ear Lobe<br>Wattles | |
| NECK | Shape | |
| | Color | |
| BACK | Shape | |
| | Color | |
| BREAST | Shape | |
| | Color | |
| BODY AND FLUFF | Shape | |
| | Color | |
| WINGS | Shape | |
| | Color | |
| TAIL | Shape | |
| | Color | |
| LEGS AND TOES | Shape<br>Plum'g<br>Color | |
| TOTAL DEFECTS | | |

**Directions for Using this Card**

To cut for weight, comb, head, legs, check (x) the features de-fective and cut in the column. For shape, make cut above the dot-ted line. For color, below the line. Shape being more defective than color cut in space for shape, but low enough to include the dotted lines. Color being the greater evil, commence figure just above the dotted line and carry deep down into color space. This secures dispatch in its use for exhibitions.

..... ..... ..... ..... JUDGE.

Pres. Secy.

### For Horses

| | |
|---|---|
| The head and its adjuncts | 10 |
| Neck and chest | 10 |
| Back and loin | 10 |
| Hips and quarters | 10 |
| Shoulder and fore arms | 10 |
| Barrel with abdominal muscle | 10 |
| Stifles and hock joints | 10 |
| Cannons and hoofs | 10 |
| Condition, hide and touch | 10 |
| | 100 |

### For Cows

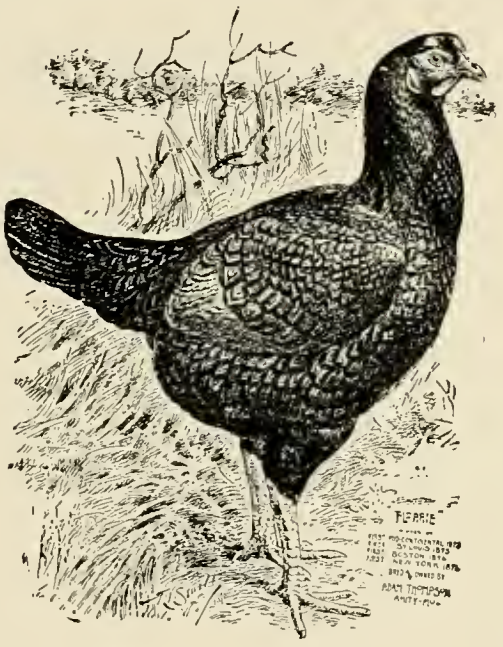
| | |
|---|---|
| Head and adjuncts | 10 |
| Neck and brisket | 10 |
| Shoulders, elbows and fore arms | 10 |
| Back and loin | 10 |
| Hips and rump | 10 |
| Barrel, ribs well sprung, hide and touch | 10 |
| Rear udder with escutcheon | 10 |
| Fore udder carried well forward | 10 |
| Teats and milk vein orifices | 10 |
| Legs, feet and locomotion | 10 |
| | 100 |

### For Bulls

| | |
|---|---|
| Head and its adjuncts | 10 |
| Neck and brisket | 10 |
| Shoulder and forearms | 10 |
| Back, loin and tail | 10 |
| Hips and rump | 10 |
| Barrel, ribs well sprung | 10 |
| Color, hide and touch | 10 |
| Rounds, stifles and twist | 10 |
| Rudimentary teats and milk veins | 10 |
| Hock, knees, locomotion | 10 |
| | 100 |

I have been asked how I can possibly compare a cock's comb with a horse's head; that is easy. We do not compare them at all. We score each and compare the record of merit to each, to-wit: A horse's head may be narrow between the eyes, which are small and indicate a sullen disposition; he may be fleshy between eyes and nostrils, nostrils small, and your quick judgment declares the head certainly 20 per cent shy; as a horseman would say "lank headed;" and you cut 2 points.

The cock's comb lacks a point of the required number "5". It



CORNISH INDIAN GAME

is corrugated along the sides hardly straight from front in the blades, and you declare him off 20 per cent, cutting 2 points, and you say they are of equal merit. Their two standards have been applied in the same way, each discounted as it deserves. In a like manner you score each section; and you find the same merit in each bill scores alike and we call all computed with equal impartiality. It matters not whether equal: Lion, wolf, horse, cows or fowl, if the truthful description is given, equal merit will score alike.

The cow's back and loin may not be straight, the hips low, thus failing in a flat wide loin and we declare her off fifteen per cent of 1½ points. The hen's wing is not folded smoothly under and all told we cut her two points and we find the cow less faulty in her

back than the hen was in her wing. Thus we do compute the merit we find in each. We do not compare the two species. We determine which has the more merit, and hence both have an equal chance to win any sweepstake prizes. Thus does the decimal system mete out justice to all, giving an equal chance simply because each and all have their standard applied by the same rule and score card tabulations of their defects.

Per cent, Discount and Interest: It is all arithmetic in the art of judging farm stock. Is there any fair reason in valuing one breed's comb one and another seven; or one breed's back ten and another's five, or one body one, and only four in another.

These standard makers forget that overvaluation is a detriment to a breed, not a help, because it gives fictitious value to any defect, as I have shown you in the beginning.

To overvalue a section is an injury to the breed; to undervalue the section is to favor the breed. Thus you see how easily a standard can be made null and void in competition; as you overvalue or undervalue those sections which we find the most liable to defects; and we see the absolute importance that the specimen's conformation shall be divided into sections of equal value; that all discounts for defects may have an equal force upon all; and absolute equity and justice prevail. This the Decimal System secures to all.

# CHAPTER XIII.

## TURKEYS

Wm. F. KIRKPATRICK, R. I. Agr'l College.

In segregating the different poultry interests of the United States, it is probable that turkeys rank second in the scale of value and that for them many millions of dollars are yearly expended. The turkey is of purely American origin, having been found here by the Spanish in the sixteenth century. Waiving all further discussion in respect to the vast sums invested in turkeys or the origin of the bird, the problem of turkey growing will now be considered.

**Breeds.** In the table below will be found the six standard varieties of turkeys with their standard weights. These are given and fully described in the **American Standard of Perfection.** There are appended three additional varieties which have come to be more or less extensively bred.

| Variety | Adult Cock | Cockerel | Hen | Pullet |
|---|---|---|---|---|
| Bronze | 36 lbs. | 25 lbs. | 20 lbs. | 16 lbs. |
| Narragansett | 30 lbs. | 20 lbs. | 18 lbs. | 12 lbs. |
| Buff | 27 lbs. | 18 lbs. | 18 lbs. | 12 lbs. |
| Slate | 27 lbs. | 18 lbs. | 18 lbs. | 12 lbs. |
| Black | 27 lbs. | 18 lbs. | 18 lbs. | 12 lbs. |
| White Holland | 26 lbs. | 18 lbs. | 16 lbs. | 12 lbs. |
| Bourbon Red | lbs. | .. lbs. | .. lbs. | .. lbs. |
| Texas Gray | lbs. | .. lbs. | .. lbs. | .. lbs. |
| Wild | lbs. | .. lbs. | .. lbs. | .. lbs. |

The Bronze is the undoubted favorite in growing turkeys for market. Probably more Bronze are bred than all other varieties combined. This may be due to their large size, brilliant plumage, and alleged hardiness. Greater domesticity, heavier egg production, and ability to stand confinement are claimed for the White Hollands which rank next to the Bronze in popularity and which doubtless exceed in numbers the remaining four standard varieties taken together. Breeding of the Narragansetts, once very popular in the East, seems to be on the wane. The Buffs, Blacks, and Slates, named according to their respective colors, are not extensively grown. Turkeys have not been so fully domesticated as to entirely deprive them of their semi-wild alertness and caution and their dis-

position to roam and wander; yet, with proper care and attention, any variety may be successfully reared on comparatively restricted areas. Range and freedom, however, are more natural and more economical.

**Obtaining Stock.** Assuming that one has no stock to start with, it would seem advisable to buy eggs for a beginning. This method is perhaps as economical as buying stock and it may afford the untrained some valuable experience, but the principal reason for its adoption is to lessen the danger of introducing to the farm some such fatal turkey disease as "blackhead," which will be more fully discussed later. If eggs are purchased, the incubation and brooding may be either natural or artificial, though the former is perhaps preferable for the beginner. To avoid any ultimate inbreeding, eggs may be secured from two breeders; then for the second year's work, the males from one lot may be mated with the females from the other

BRONZE TURKEYS

and vice versa. The eggs should be obtained and set during the last half of April so as to hatch the future breeding stock about or prior to the first of June.

**Management of the Flock.** Having acquired the parent stock either by purchase or by rearing from eggs, its care and manage-

ment is the next question that naturally arises. A tree in which to roost and an old shed in which to feed during the winter are about all the adult turkeys need, except in regions where very low temperatures prevail. Corn, wheat, and oats make a good ration, but other grains may be fed if they are cheaper. The selection of breeding birds depends largely, of course, upon the aims and desires of the breeder, but ordinarily the broad backed, full breasted, heavy set, short-legged birds are chosen. Should there occur in any of the flock a tendency to rapid maturity, this qualification may well be preserved and intensified, because the most salable birds are the quickly developed ones that weigh from twelve to twenty pounds at the first Thanksgiving season after they are hatched. In eastern markets the smaller ones are usually held over and sold at Christmas time.

**Matings.** If two or more different matings are planned, the toms or gobblers should be separated from the hens about the first of February in order to avoid any possible premature mating. All the birds should be mated not later than March first, inasmuch as the hens will probably lay about the fifteenth of this month. This laying period may vary a week or two either way according to climate and location. Extra large size seems undesirable in both males and females. The very heavy hen neither lays nor hatches so well as her somewhat smaller sister, while the very large tom may seriously injure, and sometimes even destroy, the hen in the act of mating. This, however, may be prevented to some degree by enveloping the male's spurs with cotton or cloth and keeping this muff securely fastened. Furthermore, the heavy male more frequently fails to fertilize the eggs. The author believes that a larger satisfaction will arise from breeding hens of 15 lbs. and 18 lbs. with toms weighing from 25 lbs. to 30 lbs. rather than with the heavier birds. The ratio of males to females varies with different breeders, but ought not to exceed one to ten or twelve, and perhaps one tom to eight hens would be better. In view of their value and the limited number of eggs produced, it is not good management to run the risk of poor fertilization.

**Egg and Poultry Production.** The number of eggs produced by turkeys varies greatly with the individual, but the approximate average is eighteen to twenty eggs per hen for the first clutch, and ten to twelve for the second, or a total of thirty eggs for the season. In the writer's experience in keeping individual egg records of a

flock of between fifty and sixty hens for the past three years, the average for the first batch is about eighteen, but the number of eggs has ranged from none at all to forty-six. The desirability of a large number of eggs from a single hen is questionable; for instance, from the forty-six-egg hen mentioned above, seven poults were produced, and these weaklings, while in an adjacent yard were three hens that laid thirteen eggs each or a total of thirty-nine, from which thirty-six poults were produced. Barring the ravages of "blackhead," it is believed that a breeder may count upon 90 per cent of his eggs being fertile, 70 per cent of these hatchable, and 80 per cent of these rearable. To put it another way, from every two eggs set, one poult should be grown to maturity. It is well to gather the eggs daily in order to prevent chilling at night, their destruction by dogs, foxes, and other animals, and to obviate the undesirable intermittent incubation incident to the hen's remaining on the nest an hour or so each time she lays.

**Incubation.** It takes turkey eggs from twenty-seven to twenty-nine days to hatch; variation being due somewhat to the season, close sitting of the hen, or the temperature at which the incubator is operated when artificial methods are employed. An ordinary fowl can care for from seven to nine eggs while the turkey hen incubates from fifteen to twenty according to the size of the hen and the size of the eggs.

**Care of the Young.** There need be no especial hurry about feeding the youngsters after they are hatched; any time between twenty-four and forty-eight hours after their escape from the shell will be soon enough. A great deal of difference of opinion exists in respect to the diet for young turkeys and a great many formulas have been given. In general, the same feeds that are given to chicks will suffice for poults. Finely chopped hard boiled eggs mixed with bran or rolled oats, cottage cheese, bread and milk, or some similar food, is excellent for the first few meals or until all the little ones have learned to eat. After about three days, cracked corn, hulled oats, and whole or cracked wheat may be scattered before them. Equal parts, by weight, of bran, corn meal, middlings, and beef scrap make a good mash. Any change in rations should be made gradually, not abruptly. High priced patent poultry foods are not essential, but some sort of green food is. Some allow the turkey hen to roam, caring for her young unassisted. While this method

is sometimes successful, it would seem better to confine her in a roomy pen for the first few weeks, for this time is the poult's most precarious period of life, and, therefore, shelter should be provided to protect them from cold, rain, and foes. When no blackhead is present, the danger of losses rapidly diminishes as the poults grow older. Upon arriving at six or eight weeks of age, they can largely care for themselves. Like the parent stock, they will need less and less feed and attention from the owner, requiring only an evening meal to induce them to "come home to roost."

**Fattening.** A month or so before killing time, the youngsters should be corralled and confined for fattening. Do not pen too closely, as small quarters will wear upon birds accustomed to range. Feed all the corn they will take,using it whole, cracked, as meal, or in any other form which will induce them to eat. Beef scraps and green food may be added as appetizers if the birds show need of them. Discussion relating to methods of killing, dressing, marketing, shipping, etc., cannot be entered into a chapter of this length.

## Diseases of Turkeys.

**Canker.** This disease sometimes occurs in turkeys, but it is readily diagnosed and easily cured if observed in time. Canker is recognized by white, round, and more or less cheesy or hard lumps, usually inside the mouth or throat. When appearing on the head and wattles, it is usually scaly or scabby, and is called chicken pox. Cures may be effected in most cases by removing the white patches and liberally applying to the raw areas alum, bluestone, or five per cent carbolic acid. Repeat treatment until sore spots are healed.

**Gapes.** Gape worms do not disturb old turkeys, nor youngsters to any extent after they are six weeks old. There is no really satisfactory treatment. It is a good plan to remove the poults to new ground in the hope of avoiding the infecting parasite. If the birds are placed in a close box, a cloth tied over the top, and a little quick lime rubbed through, the inhalation of the lime will produce sneezing which is said to expel some of the gape worms.

**Blackhead.** This malady works more havoc among turkeys than all other diseases combined. It was first brought to public attention in 1893 through a bulletin of the Rhode Island Agricultural Experiment Station. Since that time it has spread widely throughout the eastern states and is now more or less prevalent in the South

and in the West. Blackhead is highly communicable and exists in both endemic and epidemic form. It is notably a disease of young turkeys, destroying 70 per cent to 90 per cent of these before they are six weeks old, when they are confined in contaminated yards. Of those that temporarily escape its ravages 15 per cent to 20 per cent die before the end of the first year. Once established upon a farm, this disease will remain indefinitely active, even if turkey culture be abandoned, for the parasites of the disease (Coccidia) are carried by all domestic, and many wild, birds. There is not now any known means for its eradication. The clinical symptoms are listlessness, lagging behind or complete isolation from the rest of the flock, standing with wings drooped, and diarrheal discharges of an orange yellow color. The post-mortem examination usually reveals, especially in chronic cases, distended caeca, or "blind guts," with thickened walls showing inflammation and ulcers. The liver is usually enlarged and spotted with circular cream-yellow ulcers. Should blackhead gain a foothold, one good plan, probably the best, is to remove the young turkeys to new land or virgin soil, preferably dry and sandy, and to keep them away from the henyards or fields where fowls forage, for the latter are the most common hosts of the parasite so fatal to turkeys. Infusion of wild blood may help in that it tends to keep the flock away and roving but it will not prevent blackhead because no race of turkeys has yet been found to possess immunity. The number of remedies claimed to cure blackhead is numerous. Many poultrymen have their own "special mixture" which is said to work wonders in their own flocks, but the same preparations used elsewhere meet with indifferent success. Red pepper, cinnamon, and cloves are sometimes fed, either alone or with other things. Calomel, castor oil, salol, quinine, and boracic acid have also been recommended. Others have suggested the use of capsules containing 5 grains sulphur, 1 grain sulphate of iron, and 3 grains quinine; another combination is ½ grain sulphate of iron and 3 grains salicylate of soda; and still another is 1 grain salicylate of soda and 1 grain benzonapthol. All of these proposed remedies are of doubtful value and certainly none are unfailing cures. It now seems that drugs whose antiseptic action is sufficient to kill the parasite will also destroy the animal it is sought to cure. The outlook for medicinal treatment is, therefore, not encouraging. It is not here assumed that treatment is impossible, but merely stated that it is not yet perfected. The best and only undoubted cure for blackhead is prevention.

Two or three of the Experiment Stations, notably Rhode Island, and also the U. S. Department of Agriculture at Washington, have published turkey literature that will be sent free to farmers. These publications can be recommended to the reader who is interested enough to write for them.

## CHAPTER XIV.

# WATER FOWL

By Wm. F. SCOPPE,

## DUCKS.

There has been without doubt a greater increase in this line of poultry during the last ten years than in the fifty years preceeding. This has been due in a large measure to the introduction of new breeds and the crossing of these breeds with our original small duck, or as they are generally spoken of, "The local farm ducks." These ducks were small; they were nearly all bone and feathers, and what little flesh they did carry was coarse and had a peculiar flavor. That made them far from toothsome, so that few people cared for a second taste.

Though there has been a great increase in the number of ducks raised, yet it can be said that the duck industry is carried on by a relatively small number of breeders. Many farmers raise them, yet nearly all of these birds are used for home consumption and do not enter into commercial account. This is one industry where the supply has really seemed to create the demand, which the rapidly increasing popularity has maintained.

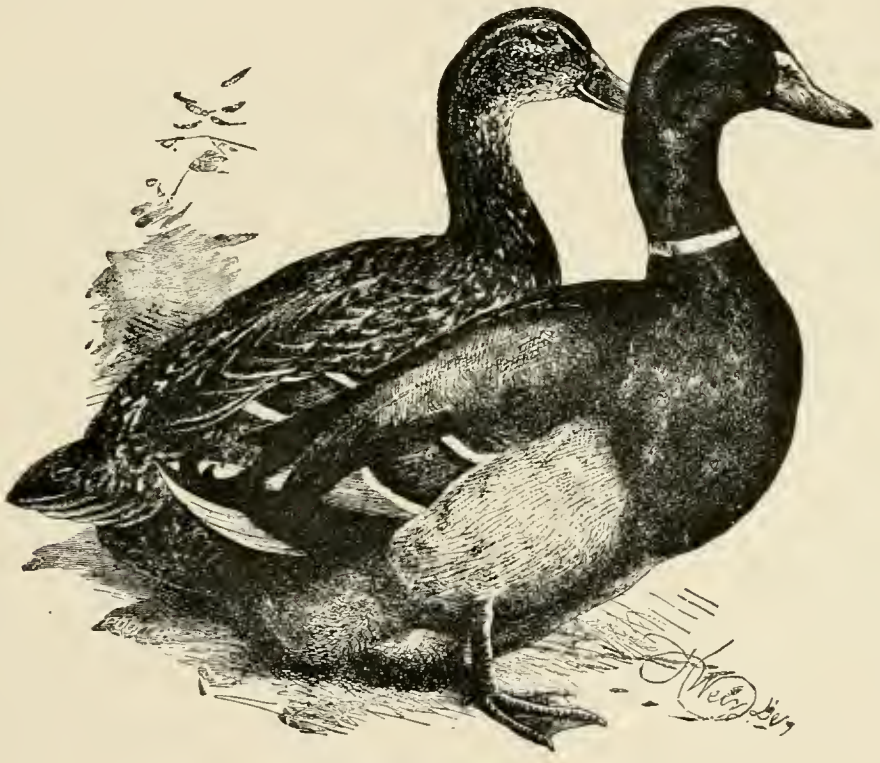
Mr. James Rankin and Mr. A. J. Hallock are admitted to be the pioneers of the industry. They both began to raise ducklings by artificial methods before 1860 and found the business profitable except for the fact that there was little market for their products, and it was about 1876 before either of them raised these birds in any quantities. Five or six years after this Mr. Rankin was raising only about 1500 per year and he had to solicit orders on account of the little demand for them. At about this time the public began to appreciate fine ducklings and a few years later, when he was raising 10,000, he could not supply the demand.

The Pekin duck has been chiefly responsible for this great improvement. The Rouen and Aylesbury were crossed on the farm duck with but little improvement; but with the introduction of the Pekins in 1873 there was at once a marked superiority shown and they rapidly grew in favor.

It is generally thought absolutely necessary that ducks be sup-

plied with a swimming place, but this is not so. Many of the largest breeders of ducks supply them with only drinking water. It is generally considered among authorities that if ducks have access to a pond or swimming place they will keep their feathers in better shape and cleaner than if they do not have such a privilege, and that the fertility is better, and promotes stronger hatches. Some breeders allow their breeding stock to have access to a swimming place, while others give their breeders only drinking water. The latter require larger yard room for exercise, if the highest fertility is to be obtained.

As the duck has no crop, it is advisable to feed only ground



ROUEN DUCKS

grains, with plenty of green and animal food. A good diet for breeders is a mixture of one part corn meal to one to two parts bran, as the foundation. To this is added 25 per cent cooked vegetables, 10 per cent meat meal or beef scrap, and a portion of grit. This is fed twice a day and in addition a good allowance of green food, such as cut cabbage, cut clover, or chopped green rye.

One drake to five ducks is considered a good ratio for the breeding flock. Taken for the season, about 50 per cent of the eggs set will hatch. They require a little longer time for incubation (28 days)

than hen's eggs. When the young come out they should not be fed for 36 hours and then fed sparingly on moist mashes. The following is a very good way to feed for the first three weeks. For the first week, equal parts rolled oats and cracker crumbs, to which is added a sixth part hard boiled eggs finely chopped and some grit. Second and third week, equal parts of rolled oats, cracker crumbs, corn meal, and bran. To this is added 5 per cent of meat and chopped green food, with grit. After this, if they are allowed free range, they will pick up nearly all their food. If they are to be fattened and killed the forced feeding can be continued, feeding equal parts corn meal and bran, with 5 per cent meat and green food, till eight weeks old. For the final weeks before killing, feed two-thirds corn meal, one-third bran, and 10 per cent meat.

Ducks are generally raised for meat production and as egg producers are of little value, though many of them lay over 150 eggs per year. The ducklings grow very rapidly, and are ready for the market in ten weeks and are sold as "green ducks.." At this age Pekin ducks have been known to weigh over 8 pounds and drakes to weigh 9 or 10 pounds.

The **American Standard of Perfection** recognizes ten breeds of ducks:

| Breed | Variety | Adult Drake | Young Drake | Adult Duck | Young Duck |
|---|---|---|---|---|---|
| Pekin | White | 8 lbs. | 7 lbs. | 7 lbs. | 6 lbs. |
| Aylesbury | White | 9 lbs. | 7 lbs. | 8 lbs. | 7 lbs. |
| Rouen | Colored | 9 lbs. | 8 lbs. | 8 lbs. | 7 lbs. |
| Cayuga | Black | 8 lbs. | 7 lbs. | 7 lbs. | 6 lbs. |
| Muscova | Colored / White | 10 lbs. | 8 lbs. | 7 lbs. | 6 lbs. |
| Crested | White | 7 lbs. | 6 lbs. | 6 lbs. | 5 lbs. |
| Swedish | Blue | 8 lbs. | 6½ lbs | 7 lbs. | 5½ lbs. |
| East India | Black | 4½ lbs. | | 4 lbs | |
| Indian Runner | White | | | | |
| Call | Gray | | | | |

Of these the Pekin stands far in the lead, both in popularity and in number raised for market. They are pure white, large, are excellent layers and rapid growers. They are deep broad-breasted birds and carry a large proportion of meat. When walking they

assume a more upright position than do the ducks of most breeds. The back part of the body should hang down and nearly or quite touch the ground. It has been the object to place the other breeds in the order of their popularity, though some breeders may not agree with this order. The East Indian and Call ducks are the bantams of the duck family.

Besides these breeds there are many oriental ducks that are seen at exhibitions. Most of these are raised for their beautiful plumage and have no value except for exhibition purposes.

## GEESE.

The goose industry is unlike the duck industry in that most of the geese are raised by the farmers and are not in the hands of a few breeders.

They pay best when they can be raised where they have access to unrestricted range or waste land, and when so kept they require only a little grain in the morning and graze for themselves the rest of the day. It is not advisable to keep them in large flocks unless they have large areas to range over, as they crop the grass even closer than sheep, and would be apt to make the soil "sour" for that year by their manure.

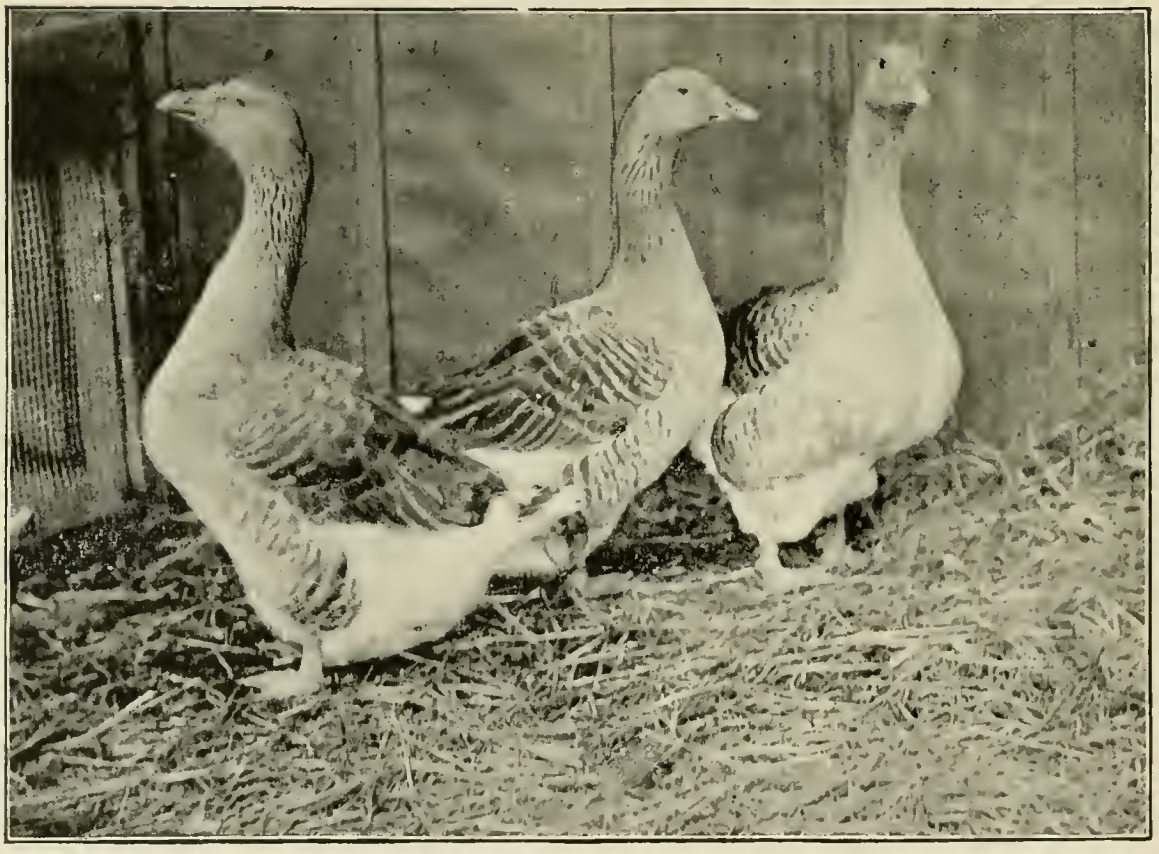
For housing they should have a comfortable shed that is well bedded down. It is not necessary to provide them with a large swimming range, though they enjoy it. A brook or irrigating ditch with a hole dug in it deep enough for them to thoroughly wash themselves is all that is needed. If neither of these can be had a big tub set in the ground can be used.

A gander is generally mated with three geese and they should be put together not later than January; a month or two earlier would be much better. The strongest birds are bred from females a year or two old. The breeding stock should not be allowed to get over fat during the winter, and better results will be obtained if they are kept rather thin. It is well to remove the eggs as they are laid and then they can be set either under the goose or under hens. If the latter way is used, they should be well sprinkled with tepid water every few days. After the eggs hatch, the goslings should not be fed for twenty-four to thirty-six hours and then sparingly for several days. It is a good plan to tether the goose so that she will not stray too far

and tire out the goslings, but after a few days they can be allowed to roam at will and require very little care. Some sort of shade should be provided as hot sun is fatal to the gosling.

The **American Standard** recognizes six breeds of geese:

| Breed | Varieties | Adult Gander | Young Gander | Adult Goose | Young Goose |
|---|---|---|---|---|---|
| Toulouse | Gray | 20 lbs. | 18 lbs | 18 lbs. | 15 lbs. |
| Embden | White | 20 lbs. | 18 lbs. | 18 lbs. | 16 lbs. |
| African | Gray | 20 lbs. | 16 lbs. | 18 lbs. | 14 lbs. |
| Chinese | Brown Gray | 12 lbs. | 10 lbs. | 10 lbs. | 8 lbs. |
| Wild or Canadian | Gray | 12 lbs. | 10 lbs. | 10 lbs. | 8 lbs. |
| Egyptian | Colored | 10 lbs. | 8 lbs. | 8 lbs. | 6 lbs. |



TOULOUSE GEESE

## SWANS.

Their chief value is for ornamental purposes in parks, although they are sometimes used for food. The flesh of the young is very

tender and resembles that of the goose, but is not quite as rich. As water ornaments for parks they cannot be surpassed, as their graceful carriage and poise while on the water places them in a class far above all other water fowl.

CANADIAN WILD GEESE

## CHAPTER XV.

## GUINEAS AND ORNAMENTAL FOWLS.

By Wm. F. SCOPPE,

As farm fowl, guineas are not particularly profitable. They lay comparatively few eggs and the flesh is not relished by most people, although in some localities young guineas are considered a delicacy. They require a wide range and cannot be easily confined, as they take to flight readily. At night they prefer to roost in trees or on some other high perch, but during the cold weather often roost with the hens. Most people object to their shrill voice; it has its advantages, however, as they will give an alarm if the poultry yard is disturbed during the night, and it is often claimed that hawks will not molest yards where guineas are kept.

### PEA FOWL

These are kept exclusively for their fine plumage. Like guineas they fly very readily and prefer high roosting places. The male bird is by far the more gorgeous and delights in displaying his beauty. The coloring of the head, neck, and large tail are most brilliant. The hens are very unattractive in appearance. The cock is inclined to be troublesome to other fowls, often killing the growing chicks and ducks. He has a loud screeching voice that is rather objectionable.

### PHEASANTS

These are the most brilliant of any of the ornamental fowls and are raised only for that reason. The most common varieties are the Golden, Silver, and Ring-Necked pheasants. Mr. Homer Davenport, of New Jersey, in 1905, had collected thirty-eight distinct varieties, many of which are very rare and of extreme beauty. His collection of pheasants is the largest and best in the world.

### FANCY AND ORNAMENTAL FOWLS.

Under this class come the breeds of domestic fowls which on account of some peculiarity either in shape, color, or other characteristic, have been bred and exhibited.

The Polish, Game, Silkie, Sultan, Frizzle, Rumpless and Bantam breeds make up this class. Most of these breeds will lay a good number of eggs and their flesh is excellent. Yet they would not be a profitable market fowl for any one who intended to make the most of the poultry industry.

# CHAPTER XVI.

## SQUAB BREEDINC.

By THOMAS WRIGHT, Massachusetts

One of the most interesting, pleasant, and profitable industries is breeding squabs for market. The great stumbling block to the beginner is his entire ignorance of the proper varieties to use for stock. So many people run away with the idea, a pigeon is a pigeon and a squab is a squab, not realizing the fact that squabs may be bred to weigh at a marketable age (about twenty-eight to thirty days) one to two pounds each. It costs no more for grain consumed than the popular six to eight ounce squab, all depending upon the varieties used; and this is all an important subject.

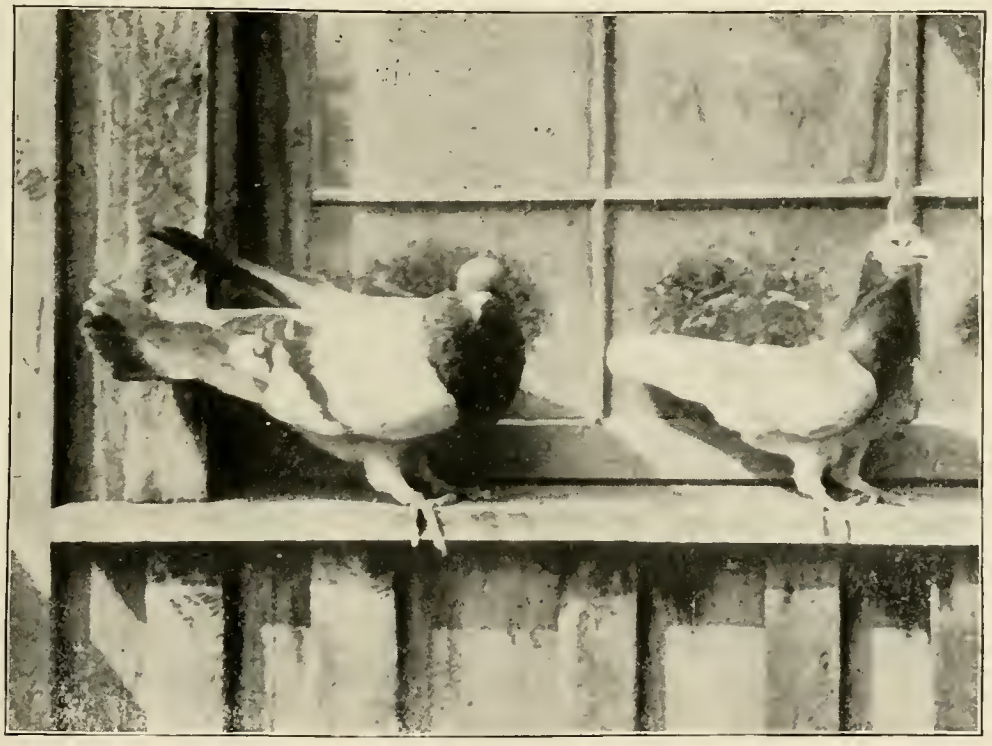
We should always bear in mind that pigeons must be grouped in two distinct classes. The fancy or toy pigeon should not be confounded with the utility or market pigeon. The fancy pigeon breeder has for his goal, beauty of outline, plumage, and every typical improvement that aids in perfecting specimens of the variety he may keep. The utility or squab pigeon breeder cares nothing for such points but regards only the qualities that go to make up a good, large, early-maturing squab, deriving the pleasure of his occupation from a poultry or market standpoint.

## BREEDING.

Pigeons are not polygamous, but breed in pairs, and when once a pair are well mated and that mating established, it is seldom or never divorced, except by the death of one or the other. The union seems to have a sacred meaning and I have known a pair of pigeons to breed together for a period of three years, then be separated for about two years; when again put in the same pen, the old love was revived and the second mates at once given up, so that there is little danger of the young containing foreign blood. After being mated, the pair select a place suited to their tastes and set up housekeeping, choosing some shelf or other apartment for their nest. Pigeons should never be allowed to build their own nests because they are apt to use too much material and erect it so high that when the

young are more than ten days old, they are liable to fall out of it. The proper way is to use earthenware nest bowls, manufactured for the purpose, nine inches across and four inches deep, and in these place about one inch of tobacco stems; this lice do not like, whereas if we use hay or straw for nest material, we are likely to breed more lice than squabs.

Pigeons lay two eggs only before sitting, the second being laid about thirty-six hours after the first, and from seventeen to eighteen days is required for incubation. If the squabs, at maturity, should prove to be cock and hen, it will nearly always be found that the cock hatched before the hen, very often twenty-four hours before, a start which the sister seldom overtakes. It is an excellent plan to keep



HOMERS

the sizes of the squabs in the nests as uniform as possible by changing from one nest to another. In infancy the squab is nourished by a soft cheesy fluid, sometimes called the pigeon's milk, which it receives from its parents, both cock and hen contributing alike, and which supports it until about a week or ten days old. It then receives grain in a partially digested condition.

Illustrative of the beautiful design of nature in nourishing the young from the moment of birth, both the cock and hen pigeons are

provided with this cheesy fluid which forms during incubation, in the membranes of the crop. Pigeons feed their young until they are far beyond the age to kill, which is about twenty-eight to thirty days, and we very often see the cock feeding squabs old enough and large enough to be ashamed of themselves. If these young are required for stock, they should be removed to another pen before the next birds hatch. When squabs are about three weeks old, a good prolific hen will again lay and so good breeding birds will hatch and raise about eight pairs of squabs per year.

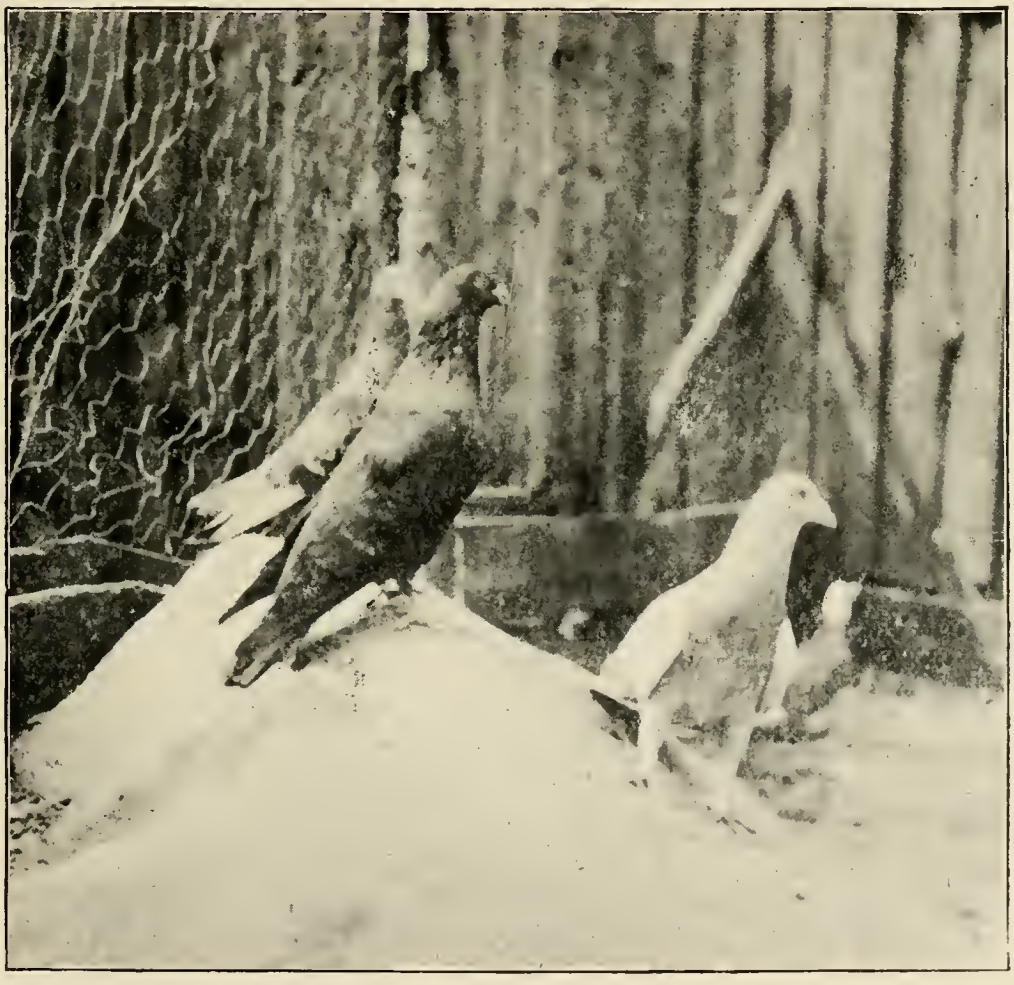
Housing pigeons does not need an extensive outlay of money, and it is astonishing how many unoccupied lofts and buildings are found upon every farm, which might be utilitzed and bring in an income of three dollars per year for every pair of breeding pigeons kept. They may be kept in any place that is dry, light, and tight, allowing three and one-half to four square feet of floor space per pair of breeders. The time required for caring properly for them is simply that required to give grain and water twice per day, all they will eat up clean; and any woman or man can take care of 300 pairs of pigeons by devoting three hours per day to the work. Cleaning out should be done about once a month. Pigeon manure is a very valuable fertilizer, but pays better sold for commercial purposes. It is used in the manufacture of leather and is always in demand at about sixty cents per bushel. We can alway depend upon the returns from this by-product to defray one-third the amount of our grain bill.

The equipment of a pigeon house includes a galvanized iron drinking fountain and a bath pan about two feet across and six inches deep. The bath should be given at least three times per week, as pigeons not only bathe for cleanliness, but also to provide the moisture necessary during incubation. Always supply at least two nests for every breeding pair of pigeons, for while one pair of squabs is growing in one nest the hen lays in another.

## FEED AND MODES OF FEEDING.

The best feed for pigeons is flint corn, if one can get it instead of the dent, red wheat, Canada field peas, equal parts and a small quantity of hemp seed. Millet is also relished by the birds, but is not a necessity. We cannot determine the actual quantity required to feed any given number of pigeons, but they should have all they will eat

up clean twice a day. It should be thrown upon the floor for them to pick up and not fed, as many advise, from a hopper. Pigeons are gluttonous and will eat far too much for health, if allowed to do so, and where a hopper is used, one breeds more mice, rats, and disease than squabs. Green food may be used and is eagerly devoured by the birds, but we must be guarded in the kind of green food used. Our poultry are very fond of cabbage and will thrive on it, while our pigeons would die if allowed free access to it. Lettuce and plantain are the only green food we can safely feed.



SQUAB BREEDERS

## VARIETIES FOR BREEDERS.

The best squab breeding bird known is the result of crossing and recrossing Florentines, Swiss Mondaines, and English (not German) runts, upon homers. In making this cross, breed the Florentine and

Mondaine together; mate the offspring to the English runt, and the young from their mating to homers. The squabs will mature as early as homers and will weigh as much again at the same age. Avoid breeding from blood relations for in-breeding results in impoverishment of the entire flock. We cannot have squab breeding birds too vigorous and by in-breeding, we at once sacrifice all vigor and oftentimes health also.*

Pigeons mature at about five months old and will then breed, but it is a good plan to always have the cock bird a little older than the hen. The period of usefulness as breeders is about ten years; the old birds should then be mated with younger females.

Too many pigeon breeders place more importance upon color than is necessary, believing that as in poultry, white squabs are superior to party-colored or dark; but if we trace the origin of all white pigeons, we shall fail to find any very prolific variety of white plumage. The thing to guard against is the color of the skin and this is always indicated by the color of the front of the leg and the beak; in a bird, even of light color, that has the front of the leg dark, the meat is dark also.

We find light flesh in the toy varieties, White Tumblers, Jacobins, Barbs, and many others, but we do not find the avoirdupois or vigor that we get in large colored birds. Black even is capable of giving us as light skinned squabs as many light colored birds and we always get good, rugged, vigorous breeders from nearly any color except white. The White Duchess, so called, is very largely kept in some sections, but it is not as prolific or as good a feeder as many of the colored varieties. I believe it is closely allied to the Pouter, a breed which possesses no quality necessary for our use as breeders of utility pigeons.

## MOULTING.

This is a period when every pigeon house is, to a certain extent, a hospital. During moulting, hemp seed may be fed, a good handful to every six birds in a house, twice a week. It is a good plan, when we see the moult progressing, to draw the tail feathers, thus saving the strain upon the system of shedding them. At this season do not allow the bath more than once or twice a week as water retards the progress of shedding. Feed liberally during this period and

* The editor does not endorse this view entirely.

at all times keep before the birds mica crystal grit, oyster shells crushed, as for poultry, and a good large lump of mineral salt and you will not be troubled with invalids.

## MARKETING.

We cannot give any definite way of killing and dressing squabs, as this depends altogether upon the market man. Some want them bled and dressed, some want the blood retained and feathers on. If the latter way is used, simply wring the neck and lay them, when killed, breast down, upon some cool receptacle. If bled, they should be picked while warm and packed in perforated barrels made for the purpose, but it is absolutely necessary that the consumer should decide this.

## CHAPTER XVII.

## DISEASES AND HYGIENE.

By WM. F. SCHOPPE

Generally speaking, it rarely pays to treat diseased fowls, for, unless the bird is very valuable for show purposes, the value of the time expended in caring for and "doctoring up" the bird will be greater than its worth. Then too, a bird that has passed through a severe sickness never, or rarely ever, regains its former activities. The person who heroically uses the hatchet on all diseased birds will come out ahead in the end, for he not only saves a great deal of time but also minimizes the chance of spreading a contagious disease.

The object should be rather to prevent than to cure. This is usually accomplished by providing proper food and shelter. A house that is so arranged as to give fowls plenty of fresh air and sunlight, one free from dampness, white frost, and draughts, and in which they are provided with a warm roosting closet where they will not freeze their combs during the coldest nights, will prevent many of the diseases which are most dreaded. If new stock has been introduced, it should be isolated for a time until a healthy condition has been assured. This is also true of stock returning from shows.

One of the greatest causes of disease is filth. The droppings should be removed at least once a week and the space under the roosts sprinkled with ashes, road dust, or lime. Any damp litter should be removed and dry material put in its place. The nests should be newly filled every few months and the house should be thoroughly cleaned at least twice a year.

Even though great precautions have been taken, diseases will sometimes creep in and, as a greater safe-guard against them, it is essential that the poultryman should know something concerning the most important diseases, their symptoms and treatment, for quite often prompt action at the outbreak of an ailment will save the entire flock.

To accomplish this, it is of supreme importance that the poultryman should acquaint himself with the anatomy of the bird. Whenever a fowl is drawn for market or for cooking, the organs should be studied to note their normal condition. It might be well

sometimes to sacrifice one to the cause. Take a healthy bird, kill it, place it on its back and cut away the lower part of the body, cut the ribs, and the breast bone, and remove the part. This will expose all the organs of both cavities in their normal conditions. Such a study will enable the poultryman to note any abnormalities whenever he makes a postmortem examination of a bird that has been found dead and will greatly aid him in establishing the cause of his losses. Too great stress cannot be put upon the importance of postmortem examinations. A great many times such an examintion will show at once just what caused the death of the bird and tells the poultryman in language more plain than words, what must be done to stop the loss. Many times inquiries are made concerning the continued loss of birds. Just a few meager symptoms are given and absolutely nothing is known of the internal conditions of the dead birds. Should these inquiries contain a full description of all symptoms prior to and after death (including a postmortem) they could be answered more easily and accurately.

The following are some of the more important diseases with suggested treatment:

**Abdominal Dropsy.** Abdomen distended with liquid, hangs down, is soft and fluctuating. The fowl becomes listless, feeble, loses appetite, comb and wattles lose color. Probably fed too much corn, or an excess of starchy foods. Practically incurable. Should have been killed and dressed before reaching this stage. Some relief may follow daily doses of one grain of iodide of potassium or iodide of iron.

**Apoplexy.** Bursting of blood vessel in the brain prostrates the fowl which is found insensible or dead, lying on its side. Comb and wattles purple. Occurs especially in over fat fowls when running or laying. Gorging with food or becoming overheated in sultry weather may bring on an attack. Avoid excess in feeding, especially of fatty or starchy foods.

**Asthenia ("going light").** Wasting of muscles due to lack of food, unbalanced rations, digestive disorders, external or internal parasites, tuberculosis, blood poisoning. Correct the conditions if possible. Give twice daily, nitrate of bismuth, three grains; powdered cinnamon or cloves, one grain; powdered willow charcoal, three grains; mixed into the mash fed or made into pills with water and flour. To disinfect the intestines, naphthal, bethol or salicylate

of bismuth may be given in one-half grain doses every four hours. If the waste is checked, give a tonic of thirty grains (½ teaspoon) each of powdered fennel, and anise; one dram each of coriander and cinchona; fifteen grains of powdered sulphate of iron, well mixed and added to the mash fed at the rate of three or four grains daily. The mash may be made of wheat middlings, corn meal, and rice flour mixed with boiled milk, adding finely chopped egg or boiled beef.

**Breakdown.** The muscles of the abdomen become weakened because of over fatness, fatty degeneration or disordered oviduct and the abdomen hangs down behind. If otherwise healthy, kill and use for the table. Avoid by feeding less fatty or starchy food, especially Indian corn.

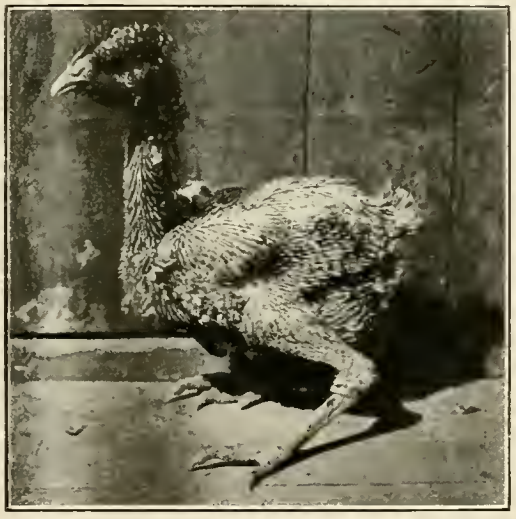
**Bumble Foot.** This is an aggravation of the condition known as corns. It is seen in cases where irritation and bruising is most severe or prolonged. The affected part is hot, painful, and more or less swollen. Sometimes an abscess has formed or, in older cases, this abscess may have broken and left a suppurating sore. In the most severe cases the joints may be inflamed, and may even be penetrated by the pus channels which have formed from the abcess. As treatment use preventive measures. Perches should be broad and flat, and of the proper height and the floor upon which the birds alight should be covered with a litter of either earth, sand, or straw, so the feet will not be bruised. For treatment, cut the abscess with a sharp knife and empty the pus. Apply boric acid ointment (boric acid, one part; vaseline, five parts) or wash with a one percent carbolic acid solution. Anoint daily with carbolated vaseline until well.

**Canker.** White, gray, or yellow patches grow on the living membranes of the mouth and throat, and swallowing is painful. Inducing conditions are colds, catarrh, roup, exposure to chilling winds, draughts and filthiness. Canker spots may be treated by gently blowing dry powdered chlorate of potash through a glass tube, or straw, upon them. Swabbing with peroxide of hydrogen twice a day, or with alum water is beneficial.

**Catarrh.** Mucous secretions form and collect in the eyes, nostrils and mouth. The bird becomes drowsy, loses appetite, shows roughness of the feathers, sneezes and wheezes. May follow catching cold, or exposure to damp chilly conditions, foul air, filthy food or water, or the attack of parasites. Remove the bird from the above conditions. Sunshine and pure air are correctives. Raw eggs,

or bread softened with milk, and green food will nourish the fowl and help it recover. If there is a swelling of the parts of the head annoint with carbolated vaseline. Inject into the mouth and nostrils, several times daily, a solution made of extract of witch hazel, four tablespoons; water two tablespoons, and carbolic acid three drops.

**Colds.** There is inflammation of the throat, nostrils, and eyes, thin watery discharges from these parts, oftentimes frothiness in the eyes, sneezing, and shaking of the head. Exposure to damp, cold, chilly, stagnant conditions causes the bird to "catch cold" and this may, if not checked, lead on to catarrh, canker, bronchitis, or pneumonia. Dry, comfortable, sunny, well ventilated quarters, active scratching for a part of their rations, pure food and water, green food to keep the bowels in order, and freedom from parasites, all tend to prevent colds.



HASTENING THE MOLT

Mix together one tablespoonful each of black pepper, ginger, mustard, and flour; add lard enough so that the mixture can be formed into pellets, not too large to be easily swallowed by the fowl. Keep in a closed glass jar and whenever the fowl shows signs of an attack of a cold, give two or three pellets at evening. Watchfulness and prompt action may often save the fowl from the diseases which readily follow colds in the head.

**Corns.** An inflammation and thickening of the skin on the surface of the foot, the result of prolonged pressure, irritation and bruises. Corns are generally caused by too small or too narrow per-

ches which compel the fowls to grasp them tightly in order to maintain their position. The firm grasp, continuing night after night, affects the circulation of the part of the foot that comes closest in contact with the perch. More or less irritation and inflammation is set up, causing the multiplication and enlargement of the cells which results in swelling and thickening of the skin. A similar condition may be caused by heavy birds flying from their perches and alighting upon a stony surface or hard floor. Suitable precautions, such as are mentioned for Bumble Foot, should be adopted to prevent the development of corns. The affected birds should be treated by paring off the thickened part, without causing bleeding, and applying boric acid ointment or painting the parts with tincture of iodine.

**Crop Bound.** Obstruction or impaction of the crop by wilted grass, feathers, strings, or other indigestible articles or from gorging with food. Give a teaspoonful of sweet oil, then manipulate the crop contents with the fingers, from the outside. If the mass does not move down the digestive tube try suspending the fowl by the legs and working the contents of the crop back to and out of the mouth. After emptying the crop give no food for thirty-six hours, but allow the fowl to drink a little water containing twenty grams of bicarbonate of soda to the quart. Then feed sparingly on bread softened with milk.

If the above treatment fails, cut into the upper part of the crop. An inch incision is large enough. Empty the crop, wash the interior with one percent solution of carbolic acid. Sew up with white silk, letting the thread ends hang outside. In a week, if the wound is healed, draw out the thread. Give for two days only water containing one or two drops of salicylic acid per quart, then feed for several days on bread moistened with milk.

**Diarrhoea.** May be caused by digestive disorders or by a sudden chill. It is liable to result from a sudden change of diet, especially if animal food is given in excess. It may follow the overloading of the digestive system with green food, fermented food, damaged grain, filthy water, or the failure to supply grit for the gizzard. Correct and regulate the feeding, clean out the intestines by a purgative dose of one teaspoon of castor oil, or twenty grains of epsom salts dissolved in a teaspoonful of water. After this treatment give for drinking water in which rice has been cooked. Scalded milk tends to correct looseness of the bowels.

**Fatty Degeneration.** Fatty particles or globules take the place of the cell tissues of internal organs, such as the heart, liver, ovules, etc. The fowls become sluggish and excessively fat. Kill and dress for the table before the fatty degeneration has involved the vital organs. Over fat conditions may be noted by watching the fowls carefully, and by handling some of them occasionally. Or, if a postmortem examination shows the intestines and other organs to be heavily covered with fat, avoid feeding the rest of the flock too much food, especially starch and fatty nutrients, and compel the fowls to scratch for at least a part of their food.

**Frost Bite.** Freezing of the comb and wattles shows in the stiffness and purple color of the frozen parts which later change to black in color and finally drop off. Thaw out gradually, applying an ointment composed of vaseline five parts, glycerine two parts, spirits of turpentine, one part.

**Roup.** Colds, contagious catarrh, and diphtheritic roup have been more or less confused on account of their close association. The first stages of all are very similar and one may follow close upon the other. Often it is stated that a cold is the cause of an attack of roup. This statement has very little foundation. A cold is the direct result of the fowls having received improper care or housing. Exposure to damp, chilly, stagnant conditions, causes the fowl to "catch cold." A cold may lead to catarrh, canker, bronchitis, penumonia or roup. Roup is caused by a bacillus (*Bacillus cacosmus*) which attacks the mucous membrane of the nasal passages, the eyes, the mouth, the pharynx and larynx. It can be readily seen that, if this membrane has been weakened by the attack of cold, the bacillus finds it much easier to exist than if it has to break down a well membrane. Since roup is caused by a bacillus which must be introduced into the flock in some way, care should be taken in bringing in new stock. They should be isolated for a time from the home flock. This also applies to stock returning from the shows. Outbreaks of roup can usually be traced to one of the above sources, or to germs being brought from the infected place by persons, animals, crates, or some other exchange that has taken place from the diseased flock to the newly infected flock. Roup is prevalent in flocks kept in filthy, damp, poorly ventilated quarters. Vigorous stock in good surroundings proves quite resistant to the disease.

During the early stages there is a thin liquid discharge from the

nostrils and mouth, frothy or running eyes, swelled head, and offensive breath. Later the secretion, instead of remaining fluid, changes to a yellowish cheesy mass, which collects and obstructs the nasal passage. It forms around the eyes, and forces the eye-ball out of the socket, at the same time collecting under the eyelids or in the corners and sometimes simulating a false membrane. Breathing is very difficult, causing the birds to stand with open beak. If at the same time diphtheria is present, a grayish yellow fibrinous exudate, called "false membrane," forms on the mucous surface of the parts mentioned. This exudate is closely attached to the living tissue so that when it is forcibly removed, a raw, bleeding surface is left. In combating roup, first remove all conditions which tend to foster it. Then, whenever a bird shows signs of being sick, remove it from the flock. Place it in a warm, clean, dry room, of even temperature, that is free from draughts of air, and then treat as soon as the earliest symptoms are detected. Disinfect the poultry house and runs with a five per cent solution of carbolic acid and repeat this disinfection at least once a week while the disease remains. Feed a well balanced ration, containing a small portion of meat scrap. Burn or safely bury all dead birds. If medical treatment is resorted to, there are a number of excellent remedies for roup on the market. If the fowl catches cold or shows any of the signs indicated, plunge its head in kerosene oil for a moment. A mixture of kerosene and olive oil, half-and-half, is less harsh in its effect upon the eyes. It can be injected into the nostrils and mouth by a syringe or oil dropper. Peroxide of hydrogen and water, half-and-half, or creoline or carbolic acid in two per cent solution may be used in the same manner. Dissolve two ounces of permanganate of potash in six pints of water and submerge the fowl's head in it for a moment. Dissolve two ounces of permanganate in twelve quarts of water and give to all the birds to drink at least three times a week and on such days give no other water to drink. Any of these liquids will help to clear the nasal and throat passages and destroy disease germs.

If diphtheria is also present apply three times a day to the diphtheritic spots in the mouth and throat, a two per cent solution of either creolin or of pure carbolic acid in water, remove the diphtheric membranes as soon as it can be done without causing bleeding from the affected surface, and continue the application of the remedy. Boric acid solution of the strength of fifteen grains to an ounce

of water may be applied to the eyes, nostrils, and mouth. It is very beneficial and has the advantage of being one of the mildest and safest remedies recommended. It may be applied as frequently as convenient, and if a pledget of absorbent cotton is saturated and held upon the membrane for some minutes, the beneficial effect is increased. Some recommend removing the membrane in this manner and then covering the affected parts with flour of sulphur.

The poultryman should never be without some of these remedies, as prompt action may save the spreading of this disease. Even if a fowl recovers, it is liable to be again attacked and birds that have had the roup should never thereafter be used as breeding stock.

**Parasites.** Another great source of annoyance to the poultryman and one which either directly or indirectly causes great losses among his birds is the presence of parasites, either external or internal. These prey upon the fowls in many ways and greatly annoy them. Some of these parasites cause an itching of the skin, others attack the feathers, either the shaft or the web, causing them to drop off; others attack the shanks, find their way under the scales, and cause the shanks to become scabby. If the poultryman will only keep his houses clean, he will have taken a long step towards preventing these pests. The buildings should be thoroughly cleaned at least twice a year and at this time they should be well whitewashed. All the droppings should be removed every week and during the warm weather it would be much better to remove them twice a week, as at this time of the year parasites are increasing very rapidly. Spraying the interior of the houses and furnishings with some strong solution will greatly assist in keeping the pests at a distance.

A solution that has proved very effective in combating lice and mites at this station is made by adding to four and one-half gallons of whitewash, one quart of kerosene and one quart of kreso. Thoroughly mix and apply with a brush or a spray pump. A spray pump is much better for applying the solutions than a brush as it forces the spray into all cracks and is also a great time saver. Either kerosene, or crude petroleum, painted or sprayed on and about the roosts, is a great help in keeping down the pests. The addition of two or three per cent of strong carbolic acid greatly increases the value of either.

Kerosene emulsion is made as follows: One-half pound of hard soap, finely cut, added to one gallon of kerosene; boil till the soap is

dissolved, churn briskly for five minutes. Use this as a stock solution, adding one quart to every five quarts of water.

Lime sprinkled under the roosts will help to keep the house free from parasites and has the additional advantage of being a disinfectant. A dusting place should also be provided for the birds. This is especially necessary during the winter months when they cannot find a place to dust outside. A box filled with fine dirt from the field or road dust, and placed in a sunny part of the house, is all that is necessary. This dirt should be secured in the fall when it is dry. Air-slaked lime can be added to the dirt and makes it a great deal more effective. If provided with such dust the birds will generally keep themselves free from lice.

If it is deemed advisable to dust each bird to rid the flock of lice, there are a number of good poultry lice powders on the market that can be obtained at any drug store. Persian insect powder is regarded as one of the best of these. It is rather expensive but does the work very effectively. To obtain the best results, it should be pure and fresh. Hold the bird by the legs over a pail or shallow box so as to catch any powder that sifts out of the feathers. Work the insect powder into the plumage down to the skin till all the fluffy feathers are full. Work the powder into the feathers on the legs, thighs, then into the fluff of the abdomen, up into the tail feathers, down the back, neck and head, then up the breast and under the wings, taking care to get it into every part of the plumage.

**Mites.** The red mites, so called because of their red color when filled with blood, are the greatest annoyance to the birds. They are yellowish, whitish, or almost transparent in color before they become gorged with blood, and are very hard to find. During the daytime they hide in the cracks in the roosts or in crevices about the roosting places. At night they come out and swarm over the birds, sucking the blood from them. In houses that are badly infected they can be seen crawling about the walls in the early morning. They are particularly annoying to setting hens, even driving them from the nest, and in some cases setting hens have been killed by these mites. Persian insect powder placed in the nest is an effective remedy when the mites attack setting hens. To facilitate combating these pests in a house, all roosts, nest boxes, and other furnishings should be made so as to be easily removed from the house.

Free use of kerosene, carbolic acid, liquid lice killer, or sheep

dip on and about the perches, roosting boards, nests, and any places where the mites are liable to be found is necessary. The best solutions used at this station for mites have already been spoken of as bing used in combating lice. If it does not do the work, more kerosene and kreso can be added.

**Scaly Leg.** The forming of scabs on the legs is due to a mite which burrows under the scales. The irritation causes an abnormal growth on the shanks. They become uneven in appearance and are crusted with a mealy substance. It is contagious and should be treated as soon as it appears. Soften the scales in warm soapy water till they can be removed without causing bleeding. Dry the shanks and apply an ointment of equal parts of lard and sulphur This should be thoroughly rubbed in. Carbolated vaseline or balsam of Peru are excellent remedies. All scales which have been removed should be burned.

Of the internal parasites, gapes and intestinal worms cause the greatest amount of damage.

**Gapes.** They are generally found only in young chickens. The chicks stand about, frequently extend the head, and gap. The feathers droop and, in later stages, the chick frequently coughs, shakes the head, and the eye lids are closed. Caused by reddish worms lodged in the wind pipe. If the chicks are strong they may be placed in a box over which burlap or cheese cloth is fastened. Fine air-slaked lime is sprinkled on the cloth, causing the chicks to breath the dust. The worms loosen their hold and are coughed up.

The worms are sometimes extracted by means of a horse hair loop or fine wire loop. All worms and dead chicks should be burned.

**Intestinal worms.** There are many kinds of these, ranging from those only a fraction of an inch in length up to those several inches long. Of these the tape worms and the round worms do the greatest harm. Round worms are formed of short flat sections which may break apart at any joint. Birds affected with worms grow thin and lose their appetite, are weakened, and the feathers lose their luster. In combating worms care should be taken to keep the soil over which the chicks range clean. This can be done by changing the run every year or two and allowing a crop to grow on it, or by plowing it up and reseeding it. The houses also should be kept clean. In treating the affected birds, powdered areca nut, from twenty to forty

grains (about one-half teaspoonful per each fowl), given either in mash, or mixed with butter and made into pills, is very effective. Powdered male fern, thirty grains to one dram (one-half to one teaspoonful) per fowl, or oil of turpentine (one-half to one teaspoonful) are also very effective. The turpentine may be diluted with an equal part of olive oil if desired. It is a good plan to follow any of these remedies in two or three hours with a dose of castor oil.

In writing this chapter, frequent use has been made of the works of some of the leading medical authorities on the subject, also bulletins by the Agricultural Department at Washington, D. C., and various Experiment Stations.

D. E. Salmon's "The Diseases of Poultry," published by George E. Howard, Washington, D. C., is an excellent book on the subject.

Arthur A. Brigham's "Progressive Poultry Culture," published by the "Torch Press," Cedar Rapids, Iowa, has a fine chapter on diseases. Both are valuable books and are worthy of a place in any poultryman's or farmer's library.

Issued May 20, 1909.

U. S. DEPARTMENT OF AGRICULTURE.

FARMERS' BULLETIN 357.

# METHODS OF POULTRY MANAGEMENT AT THE MAINE AGRICULTURAL EXPERIMENT STATION.

Compiled by

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GOVERNMENT PRINTING OFFICE.
1909.

# LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Bureau of Animal Industry,
*Washington, D. C., January 20, 1909.*

Sir: I have the honor to transmit herewith a manuscript entitled "Methods of Poultry Management at the Maine Agricultural Experiment Station," which is mainly a compilation and revision of material contained in Bulletin 90 of this Bureau and in various bulletins of the Maine station, the authors of which were Dr. Charles D. Woods and the late Prof. Gilbert M. Gowell. In addition there are included descriptions of such new and improved methods and appliances as have been put into practice since those bulletins were issued. The work of compilation and revision has been done by Dr. Raymond Pearl, Expert in Poultry Breeding of this Bureau and Biologist of the Maine Station. Credit for originating the methods and practices described, with a few exceptions, belongs to Professor Gowell.

Poultry investigations have been a special feature at the Maine station for many years, and the results of the experimental and practical work have been of much value to poultrymen throughout the country. Since 1904 the work has been carried on by cooperation between the station and this Bureau. As there has been a very large demand for information as to the methods of poultry management employed at the Maine station, and as the publications mentioned are no longer available, the present paper has been prepared and is respectfully recommended for publication as a Farmers' Bulletin.

Respectfully,

A. D. Melvin,
*Chief of Bureau.*

Hon. James Wilson,
*Secretary of Agriculture.*

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# ILLUSTRATIONS.

# METHODS OF POULTRY MANAGEMENT AT THE MAINE AGRICULTURAL EXPERIMENT STATION.

## INTRODUCTION.

Many years' practical experience in raising and keeping poultry and investigations in poultry breeding at the Maine Experiment Station have resulted in the accumulation of a considerable fund of information on poultry management. It is the purpose of the following pages to outline this experience for the benefit of poultry keepers and thereby to help them to discriminate between some of the wrong theories which have underlain much of the common practice of the past and the better theories which underlie other and newer methods that are now yielding more satisfactory results. It may be that these methods are no better than those practiced by others, but the attempt is made to state concisely the methods which have been or are now being successfully employed at the station.

## THE SELECTION OF BREEDING STOCK.

There are two or three much-advertised methods of judging a hen's productiveness from certain signs and marks, the secret of which will be disclosed by the inventor for a monetary consideration. The Maine station has not invested in nor investigated any of these methods. There may be ways to prophesy accurately what a hen will do in the way of egg production, but they have not come to the writer's attention.

### EARLY LAYING A VALUABLE INDICATION.

The only absolutely sure way of making selection for breeding stock is by means of the data obtained from the use of trap nests. Only investigators and an occasional poultryman, however, can afford the equipment and the expense involved in operating trap nests, but every poultryman can, by closely observing his young stock during the autumn, select the pullets that are commencing or preparing to lay, and secure for the next season's breeding a pen of birds that have the function of egg production so strongly developed that they give evidence of it by its early exercise.

As evidence of the value of early-laying pullets, attention is called to the work performed by 29 April-hatched pullets that were selected from among their sisters out on the range in August and September, when they showed that they were laying or about to begin laying. They were not selected because of form or type as indicating egg production, but they were either just picked up as they were found on the nests or taken because their combs were red or because they tagged the attendant around and prated in the everyday hen language about the work they were soon going to do. They were carried to the laying house, marked with bands, and given access to trap nests.

Four of the 29 died within the year. The smallest layer of the remaining 25 laid 137 eggs the first laying year; 18 laid more than 160 eggs; and 8 laid over 200 eggs, and the average of the flock for the twelve months ending August 30, 1905, was 180 eggs. This average was much higher than that of all the pullets carried that year, and the flock contained no poor layers, but a phenomenal number of high layers. The high average of the flock and the large proportion of good layers point out the advantages of this method of selection when the use of trap nests, or other equally reliable methods of selection, is not practicable.

Poultrymen are generally desirous of securing as many well-bred pullets as possible, and so use 1-year-old hens as breeders in addition to their 2-year-olds. The work done by pullets from September to February or March is a pretty good indication of their usefulness, and their eggs are available for breeding during the pullet year. While the chickens from such eggs are not generally so large at maturity as those from older hens, they do not appear to lack constitution or vigor, and there is no apparent reason why they are not desirable for breeding purposes.

## RAISING CHICKENS BY NATURAL PROCESSES.

While even the small grower of chickens in many cases uses an incubator for hatching, circumstances sometimes make it necessary to hatch and raise chickens by aid of the mother hen. To persons so situated an outline of the method practiced at the station before incubators had reached their present development may be helpful. An unused tie-up in a barn was taken for the incubating room and a platform was made along the inner side. The platform was 3 feet above the floor and was 2½ feet wide and 50 feet long. It was divided into fifty little stalls or nests, each 1 foot wide, 2 feet long, and 1 foot high. This left a 6-inch walk along the front of the nests for the hens to light on when flying up from the floor. Each nest had a door made of laths at the front, so as to give ventilation. The door was hinged

at the bottom and turned outward. Across the center of each nest a low partition was placed, so that the nesting material would be kept in the back end—the nest proper. For early spring work paper was put in the bottom of the nest, then an inch or two of dry earth, and on that the nest, made of soft hay.

Whenever half a dozen hens became broody they were taken in from the henhouse and put on the nests, each nest having a dummy egg in it; the covers were then shut up, and nearly every hen seemed contented. In a day or two 13 eggs were placed under each hen. Every morning the hens were liberated as soon as it was light, when they would come down of their own accord and burrow in the dry dust on the floor, eat, drink, and exercise, and in twelve or fifteen minutes they would nearly all go onto the nests voluntarily. In the afternoons one would occasionally be found off the eggs looking out through the slatted door. If she persisted in coming off she was exchanged for a better sitter. The double nest is necessary, otherwise the discontented hen would have no room to stand up, except on her nest full of eggs, and she would very likely ruin them. There was no danger of this with the double nest, as she would step off the nest, go to the door and try to get out.

The advantages of a closed room in which to confine the sitters are many, as the hens are easily controlled and do not need watching as they do when selecting nests for themselves, or when sitting in the same room with laying hens. A room 12 feet square could be arranged so as easily to accommodate 50 sitters.

The most satisfactory arrangement used at the Maine station for the accommodation of the hen with her brood of young chicks consisted of a closed coop about 30 inches square, with a hinged roof and a movable floor in two parts, which would be lifted out each day for cleaning. This little coop had a wire-covered yard attached to it on the south side. The yard was 4 by 5 feet in size and $1\frac{1}{2}$ feet high. Its frame was of 1-inch by 3-inch strips and was fastened securely to the coop.

The wire on the sides was of 1-inch mesh, but on top 2-inch mesh was sufficient. Such a coop is easily kept clean, and the coop and yard can be set over onto clean grass by one person.

The small run will be sufficient for the first few weeks, but soon the chicks need greater range, and then the fence at the farther end of the run can be lifted up 3 or 4 inches and they can pass in and out at will, while the mother will be secure at home and they will know where to find her when they get cold or damp or need brooding. Such a coop accommodates 15 to 20 chicks until they no longer require brooding, after which several flocks should be combined in one and put in a portable house on a grassy range.

Whenever the hen is allowed to hatch or to mother chicks, much care must be exercised to prevent lice from getting a foothold and ruining the birds. The free and frequent use of fresh insect powder upon the hen, working it through the feathers to the skin, is one of the best methods for destroying the pests. Grease or oil is effective when applied to the heads and under the wings of young chicks, but care must be taken not to get too much on them, especially during damp weather. The feeding of chicks raised in coops with their mothers does not vary much from the feeding of those raised in brooders as described on page 11.

## RAISING CHICKENS BY ARTIFICIAL PROCESSES.

Incubators have been so much improved that there are several kinds on the market that will hatch as many chicks from a given lot of eggs as can be done by selected broody hens. They require little care, maintain an even temperature, and are easily adjusted to meet the increase in temperature arising from the developments going on in the eggs. In some machines the moisture supply is automatic and adapted to the requirements; in others it has to be supplied, and skill is necessary in determining the quantity needed. The economy of the incubator is very great. A 360-egg machine will do the work of nearly 30 broody hens, and can be kept at work continually if desired.

### THE INCUBATOR.

There are many makes of incubators on the market, most of which will give fairly satisfactory results. The Maine station has not tested many makes of incubators, and very likely some of the makes not tested would prove as satisfactory as the make used. Where many machines are used the hand turning of the eggs absorbs considerable time. Several turning devices are in vogue and equally good hatches have been obtained with them as when the eggs have been turned by hand. Machines that have artificial turning shelves will not hold quite as many eggs as when flat shelves are used, but the saving of time compensates for this.[a]

Whatever make of incubator is used, pains should be taken to become thoroughly acquainted with the machine before the eggs are put into it. It is advisable for a person not familiar with the use of an incubator to run the machine empty for several days before filling it. After the eggs are put in, changes and adjustments should

[a] A complete and useful discussion of the different types of incubators and the methods of managing them to get the best results is given in Farmers' Bulletin 236, "Incubation and Incubators," which may be obtained free on application to the Secretary of Agriculture, Washington, D. C.

be made with the greatest care for fear of extreme results. By the use of an incubator it is possible to determine exactly the time when the chickens shall be hatched. With the strain of Barred Plymouth Rocks bred by the Maine station it was formerly necessary to hatch the chickens in March in order to have them ready for November laying. By better methods of feeding, breeding, and treatment, it is now possible to delay the hatching until April and the first of May and have the pullets in good laying condition the last of October and early in November. Chickens hatched in March under the present method of breeding and feeding would in some cases begin laying in August.

## THE INCUBATOR ROOM.

It is important that the incubator room be so situated that it can be kept at a fairly constant temperature. On this account an underground room is usually selected. For many years the well-lighted cellar under the wing of the farmhouse was used by the Maine station. A cold or badly ventilated cellar would, however, be poorly adapted for incubators. Ventilation is very important, and where several incubators are in use artificial ventilation must be provided, in order that the machines may be furnished with clean, fresh air at all times.

In 1905 the Maine station erected an incubator house which practically consists of a well-made, light, airy cellar with a house for the poultry man above it. The incubator room, which occupies the entire cellar, is 30 feet square. The room is 7 feet high in the clear, 5 feet of which is below the level of the outside ground. It is lighted by six 3-light windows, carrying glass 10 inches by 16 inches. The cement walls are finished smooth and the cement floor is slightly inclined toward the southeast corner where the intake of the drain is located. This enables the free use of water from hose in cleaning the room preparatory to starting the incubators. Two chimneys extend to the basement floor and contain ventilating flues that have no opening into the rooms above. Entrance to the room is through a covered outside cellar stairway leading into a shed at the rear of the building. The room now contains twelve 360-egg machines in addition to several of smaller capacity.

In the directions which accompany the hot-air incubators of the type used at the station it is stated that an artificial source of moisture is not needed in operating these incubators except in very arid parts of the country. It is said that in other places the normal moisture of the atmosphere is sufficient to insure the necessary moisture in the incubator. The experience of the station indicates that except in a rather wet season this is not the case. It has been found here that in an ordinary season if no artificial moisture is

supplied to the incubators there is too great an evaporation from the eggs. It is demonstrable that many eggs fail to hatch because of this dryness of the air in the incubator. It is not desirable here to enter into a detailed discussion regarding experiments on this point. It suffices to state the fact that in the station's experience better hatches have been obtained when moisture beyond that normal in the atmosphere is supplied during incubation. The most satisfactory way to supply this extra moisture has been found to be by wetting the cement floor of the incubator cellar thoroughly two or three times a day, depending on the degree to which evaporation is taking place. During the hatching season the aim is to keep the floor of the incubator cellar moist at all times.

## BROODER HOUSES.

The poultry plant erected by the Maine station in 1897 included a permanent brooder house. The house was 14 feet wide by 60 feet long. Its front wall was 4 feet 10 inches high from the bottom of the sill to the top of the plate, and the back was 7 feet high. The ridge was 4 feet from the back side and 1 foot 6 inches higher than the back plate. This gave the short part of the roof back of the ridge and the long part to the front of it. The frame of the building was of 2 by 4's; it was boarded on the outside with hemlock boards, covered with paper, and shingled all over, and the building was ceiled on the inside with matched pine. This gave a 4-inch dead-air space in the walls and roof. The house also had a tight double floor with paper between. The front wall was 3 feet 8 inches high inside and the back wall 5 feet 9 inches from floor to ceiling. There was a 3½-foot door in each end; there were ten windows in the front wall, equal distances apart and 8 inches from the floor, and five windows in the back wall close up to the plate. The windows had 6 panes each of 10 by 12 inch glass and were in two parts, so as to slide up and down and admit fresh air and to keep the house cool in warm weather. The windows were all double. There were ten small doors, each 10 by 12 inches, placed close to the floor along the front wall, through which chickens could pass in and out; these doors were also double. Two galvanized iron ventilators at the top extended from the inside of the room up through the ridge and furnished sufficient ventilation during cold weather. The ventilators were regulated by means of a shut off at the ceiling.

The house was divided into ten breeding pens, each 6 feet by 10 feet 8 inches. The partitions between the pens consisted of an 8-inch board at the bottom with 3 feet of 1-inch-mesh wire above. A walk 2½ feet wide extended along the back of the building. The doors which led from the walk to the pens were made to swing both ways

and were covered with wire. A brooder was placed in each pen with a lamp door opening into the walk. Each of these pens accommodated about 60 chicks in winter, or 75 in spring when they could get out into the yards. The building, being low posted, was kept warm enough in winter by the ten brooder stoves, and the temperature under the hovers was usually found in the morning about the same as it was left the night before.

This house proved to be thoroughly satisfactory, but was burned in the spring of 1897 and has not been replaced. A permanent brooder house would be indispensable for the raising of winter chickens, and a house piped for hot water would have some advantages over the one here described. The advantages are especially great when raising chickens if April or May prove to be cold or wet, for then the

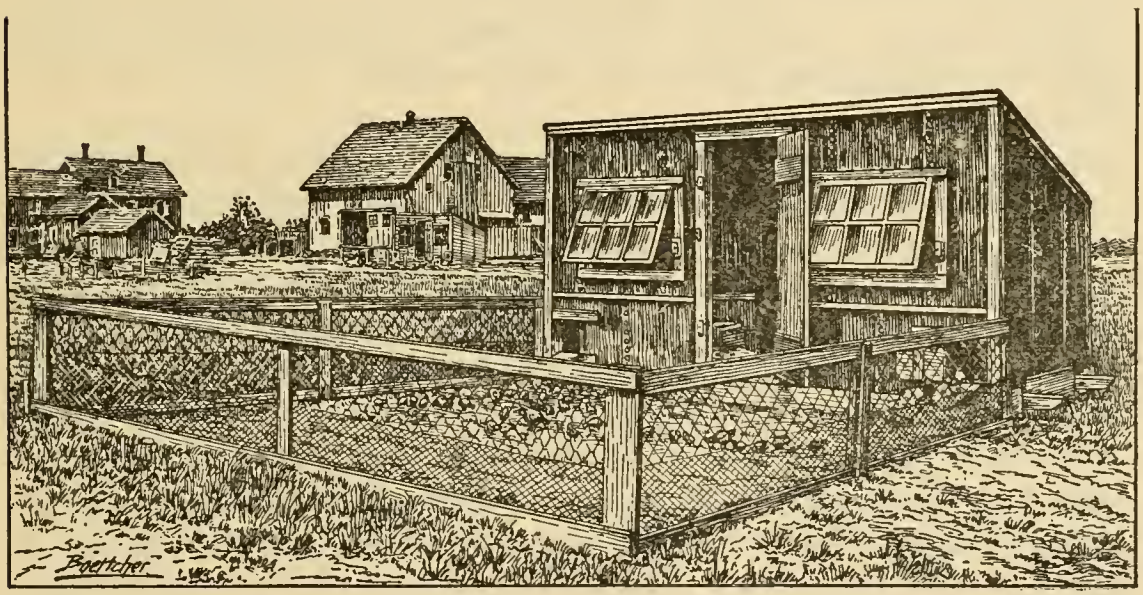

FIG. 1.—Portable brooder house.

small houses are apt to be cold outside of the brooders. In ordinary seasons, even in Maine, little or no difficulty is experienced in raising chicks hatched in April and May in the small houses. The expenditure would be greater for the piped house, for the reason that colony houses should be provided in which the chickens may be sheltered after they leave the brooder house.

Since the burning of the house just described, the Maine station has used small portable brooder houses (see fig. 1). The small brooder houses built on runners are readily moved about, and for the work with spring-hatched chickens are preferred to the large permanent brooder house. Several styles and sizes have been used, but the following meets the needs of the station better than any other that has been tried. The houses are built on two 16-foot pieces of 4 by 6 inch timber, which serve as runners. The ends of the timbers, which

project beyond the house, are chamfered on the underside to facilitate moving. The houses are 12 feet long; some of them are 6 feet and others 7 feet wide; 7 feet is the better width. They are 6 feet high in front and 4 feet high at the back. The frame is of 2 by 3 inch lumber; the floor is double boarded, and the building is boarded and covered with a good quality of heavy roofing paper. Formerly shingles were used for the outside covering, but paper is preferred and is now used exclusively. This kind of covering for the wall is not so likely to be injured in moving as shingles. A door 2 feet wide is in the center of the front and a 6-light window, hinged at the top, is on each side of it. Two brooders are placed in each of these houses and 50 to 60 chicks are put with each brooder. A low partition separates the flocks while they are young, but later it has to be made higher. The houses are large enough so that a person can go in and do the work comfortably, and each one accommodates 100 chicks until the cockerels are large enough to be removed. One of these houses is shown in figure 1.

An improvement has recently been made in these brooder houses by providing for better ventilation. When the weather is very hot there is no movement of air within one of these houses, even though the door and windows are open. The air within the house is practically stagnant and, on account of its relatively small volume, becomes intensely hot and stifling when the temperature outside gets high. The effect on the chicks under such circumstances is bad. They retreat to the houses to get shade, but only to be injured if not killed by the hot, stifling air of the house. To remedy this difficulty a slot 2 feet long and 1 foot wide has been cut in the back of each house high up under the eaves. This slot is closed with a wooden slide running in grooves which are put on the outside of the house. The opening is covered on the inside with 2-inch mesh chicken wire. On very hot days the slide is pulled out completely so as to expose the whole opening of the slot. At night or during a period of wet, cold weather the size of the opening is regulated to suit the conditions. It enables one to keep a current of fresh air through the house in the warmest weather. The effect on the well-being of the chicks during a period of hot weather is most marked and satisfactory.

Indoor brooders are used at the Maine station and are much preferred to any outside brooders the station has tried. The style used has the cover and part of one side arranged to turn down, making an inclining run the whole width of the brooder, up and down which the little chicks can go without crowding.

Most kinds of brooders as now made keep the chicks comfortable at desired temperatures and have good means of ventilation. The great difficulty lies in the lamps used. The lamp apartments are

small and the tendency is for the oil to become warm and form gases which cause the flame to stream up and make trouble. Most brooder lamps have water pans between the oil tank and the burner which tend to keep the oil cool, but even with this precaution the Maine station has had two fires, one of which was very serious. The brooders now in use have no water pans, but are so arranged that currents of cool air pass constantly over the oil tank and keep its contents cool. These lamps, or stoves, have been used for four years—last year more than 20 of them—and they are apparently safe.

## TREATMENT OF YOUNG CHICKS.

When the chicks are 30 to 40 hours old they are carried in warm covered baskets to the brooders, and 50 or 60 are put under each hover, where the temperature is between 95° and 100° F. The temperature is not allowed to fall below 95° F. during the first week, or 90° F. during the second week; then it is gradually reduced according to the temperature outside, care being taken not to drive the chicks out by too much heat, or cause them to crowd together under the hover because they are cold. They should flatten out separately when young, and a little later lie with their heads just at the edge of the fringe of the hover. They should never be allowed to huddle outside of the brooder. They huddle because they are cold, and they should be put under the hover to get warm, until they learn to go there of their own accord. Neither should they be allowed to stay under the hover too much, but in the daytime should be forced out into the cooler air where they gain strength. They ought not to be allowed to get more than a foot from the hover during the first two days; then a little farther away each day, and down onto the house floor about the fourth or fifth day, if the weather is not too cold. They must not get cold enough to huddle or cry, but must come out from under the hover frequently.

The floor of the brooder is cleaned every day and kept will sprinkled with sharp, fine crushed rock, known in the market as "chicken grit." The floor of the house is covered with clover leaves or with hay chaff from the feeding floor in the cattle barns.

## FEEDING YOUNG CHICKENS.

The best method of feeding young chicks is at present a matter of some uncertainty, and it is doubtful if there ever will be general agreement as to the one best method. One condition, however, appears to be imperative, and that is that the young things be not allowed to overeat. A number of different methods of feeding young chickens have been used at the station in the past. The most useful of these methods follow.

**Method 1.**—Infertile eggs are boiled for half an hour and then ground in an ordinary meat chopper, shells included, and mixed with about six times their bulk of rolled oats, by rubbing both together. This mixture is the feed for two or three days, until the chicks have learned how to eat. It is fed with chick grit, on the brooder floor, on the short cut clover or chaff.

About the third day the chicks are fed a mixture of hard, fine-broken grains, as soon as they can see to eat in the morning. The mixture now used has the following composition:

| | Parts by weight. |
|---|---|
| Cracked wheat | 15 |
| Pinhead oats (granulated oat meal) | 10 |
| Fine screened cracked corn | 15 |
| Fine cracked peas | 3 |
| Broken rice | 2 |
| Chick grit | 5 |
| Fine charcoal (chick size) | 2 |

It is fed on the litter, care being taken to limit the quantity, so they shall be hungry at 9 o'clock a. m.

Several of the prepared, dry, commercial chick feeds may be substituted for the broken grains. They are satisfactory when made of good, clean, broken grains and seeds, but they contain no secret properties that make them more desirable than the home-mixed broken grains mentioned above. Their use is simply a matter of convenience. When only a few chicks are raised, it is generally more convenient, and probably not more expensive, to buy the prepared feed, but when many are raised it is less expensive to use the home-mixed feeds.

Sharp grit, fine charcoal, and clean water are always before the chicks. At 9 o'clock the rolled oats and egg mixture is fed in tin plates with low rims. After they have had the feed before them five minutes the dishes are removed and they have nothing to lunch on. At 12.30 o'clock the hard-grain mixture is fed again, as in the morning, and at 4.30 or 5 o'clock they are fed all they will eat in half an hour of the rolled oats and egg mixture.

When they are about 3 weeks old the rolled oats and egg mixture is gradually displaced by a mixture having the following composition:

| | Parts by weight. |
|---|---|
| Wheat bran (clean) | 2 |
| Corn meal | 4 |
| Middlings, or "red dog" flour | 2 |
| Linseed meal | 1 |
| Screened beef scrap | 2 |

This mixture is moistened with water just enough so that it is not sticky, but will crumble when a handful is squeezed and then

released. The birds are developed far enough by this time so that the tin plates are discarded for light troughs with low sides. Young chicks like the moist mash better than that not moistened, and will eat more of it in a short time. There is no danger from the free use of the properly made mash twice a day, and since it is already ground the young birds can eat and digest more of it than when the feed is all coarse. This is a very important fact, and should be taken advantage of at the time when the young chicks are most susceptible to rapid growth, but the development must be moderate during the first few weeks. The digestive organs must be kept in normal condition by the partial use of hard feed, and the gizzard must not be deprived of its legitimate work and allowed to become weak by disuse.

By the time the chicks are 5 or 6 weeks old the small broken grains are discontinued and the two litter feeds are wholly of screened cracked corn and whole wheat. Only good clean wheat that is not sour or musty should be used.

When young chicks are fed as described, the results have always been satisfactory if the chicks have not been given too much of the scratch feed and if the dishes of ground material have been removed immediately after the meal was completed. The objections to this system of feeding are the extra labor involved in preparing the eggs, mixing the feed with water, and removing the troughs at the proper time.

**Method 2.**—This is like Method 1, except that fine beef scrap is used instead of boiled eggs and the mash is not moistened.

Early in the morning the chicks are given the hard feed on the floor litter as described in Method 1. At 9 o'clock they are fed a mixture having the following composition:

| | Parts by weight. |
|---|---|
| Rolled oats | 2 |
| Wheat bran | 2 |
| Corn meal | 2 |
| Linseed meal | ½ |
| Screened beef scrap | 1 |

This is given in the plates or troughs, and the dishes are removed after ten minutes' use.

At 12.30 the hard grains are fed again, and at 4.30 or 5 the dry-meal mixture is given to them for half an hour or left until their bedtime. The meal being dry, the chicks can not eat it as readily as they can the egg and rolled oats or the moistened mash. For that reason it is left for them to feed upon longer than when moistened with the egg and water, but is never left before them more than ten minutes at the 9-o'clock feeding time. The aim is to give them enough at each of the four meals so that their desire for food

may be satisfied at the time, but to make sure that they have nothing left to lunch upon. It is desired to have their crops empty of feed before feeding them again. When treated in this way they will have sharp appetites when the feeder appears, and come racing out from the brooder to meet him. If they have been overfed at the previous meal, and have lunched when they saw fit, they do not care for the feeder's coming. If overfed a few times the creatures become debilitated and worthless.

What has been said so far is with reference to chicks that are hatched out in early spring, at a season of the year when it is impossible under the climatic conditions in Maine for them to get out of doors for work.

**Method 3.**—This is like Method 2, except that the first mash for the young chicks has the following composition:

| | Parts by weight. |
|---|---|
| Wheat bran | 4 |
| Corn meal | 3½ |
| Linseed meal | ½ |
| Screened beef scrap | 2 |
| Alfalfa meal | 1 |

This mixture is scalded and then dry rolled oats are mixed with it in the proportion of 2 parts rolled oats to 6 parts of the mixture. The reason for mixing in this way is that it has been found by experience that if rolled oats are mixed with the other materials of the mash before scalding there is a tendency for the mash to be soggy after it is wet. Mixing in the way here outlined has been found to improve the mash greatly.

This mash and the dry grains are fed as in Method 2 until the chicks are about 3 weeks old. From 3 weeks on to 6 or 8 weeks the composition of the mash is as follows:

| | Parts by weight. |
|---|---|
| Wheat bran | 2 |
| Corn meal | 3 |
| Linseed meal | ½ |
| Daisy flour | 1 |
| Beef scrap | 1 |

**Method 4.**—When warm weather comes and the later-hatched chicks are able to get out on the ground they find much to amuse them, and they work hard and are able to eat and digest more feed. Under these conditions the dry-meal mixture described in Method 2 is kept constantly before them in troughs, with good results. With two feeds a day of the broken grains in the litter they have hard feed enough to insure health and they can safely peck away at the dry-meal mixture—a mouthful or two at a time—when they seem to happen to think of it, and thrive. This method has been considerably used in feeding April and May hatched chicks. Many times the results

from it have been good. At other times, when the weather was dark and raw out of doors and the little things were held inside, they would hang around the troughs and overeat. They would grow rapidly for a few days, then commence to go lame, eat little, and seek the warm hover never to recover.

**Method 5.**—This consists in feeding the cracked corn, cracked wheat, pin-head oats, and millet seed in the litter four times a day, and keeping a trough of fine beef scrap within reach all the time. Sometimes commercial chick feeds have been used instead of the cracked corn, wheat, oats, and millet. By this system the losses of birds have been small when the feeding has not been so liberal as to clog the appetite. Much care is necessary in adjusting the quantity of feed to the needs of the birds.

Other methods of feeding young chicks have been tried and the results watched. Method 1 has been used for several years and no other has been found that gives better growth or less losses of birds. The only objection to it is the labor required in preparing the feed. In the work of the station Method 3 is now preferred and used. The losses of chicks are small by either of the methods. The labor in Method 2 is considerably less than is required in Method 1. Where either Methods 1, 2, or 3 are used the liability of injury to the chicks is much less than when Methods 4 or 5 are followed.

There are no mysteries connected with the raising of the young chickens. Every chick that is well hatched out by the twenty-first day of incubation should live, and will do so as a rule if kept dry, at reasonable temperatures, and not allowed to overeat.

The most careful work of the poultryman during the whole year is required in getting the chicks through the first three weeks of their lives successfully. If they are vigorous up to the fourth week, there is little liability of injuring them thereafter by any system of feeding, if it is only generous enough and they have their liberty.

## FEEDING CHICKENS ON THE RANGE.

By the middle of June the chickens that were hatched in April are being fed on cracked corn, wheat, and the mash. At about that time the portable houses containing the chickens are drawn from their winter locations out to an open hayfield where the crop has been harvested and the grass is short and green. If not too much worn, the same field may be used a second season for chickens, but this is not recommended. A new, clean piece of turf land should be used each year. Two acres should be allowed for each 1,000 chickens.

When the chickens are moved to the range, the sexes are separated. The methods of feeding the cockerels and pullets differ, and there has been a gradual change in the methods of feeding. Each method

has given good results. The changes have been introduced to save labor. After the chickens were moved to the range they were fed in the morning and evening with a moistened mixture of corn meal, middlings, and wheat bran, to which one-tenth as much beef scrap was added. The other two feeds were of wheat and cracked corn.

In 1904 a change was made in the manner of feeding 1,400 female chickens by omitting the moist mash and keeping in separate slatted troughs cracked corn, wheat, beef scrap, cracked bone, oyster shell, and grit where they could help themselves whenever they desired to do so. Grit, bone, oyster shell, and clean water were always supplied. There were no regular hours for feeding, but care was taken that the troughs were never empty.

In 1905 another trough containing a dry mash consisting of 1 part wheat bran, 2 parts corn meal, 1 part middlings, and 1 part beef scrap was used in addition to those containing the grains. The results were satisfactory. The labor of feeding was far less than that required by any other method tried. The birds did not hang around the troughs and overeat, but helped themselves, a little at a time, and ranged off, hunting or playing, and coming back again to the food supply at the troughs when so inclined. There was no rushing or crowding about the attendant, as is usual at feeding time where large numbers are kept together. While the birds liked the beef scrap, they did not overeat of it. During the range season, from June to the close of October, the birds ate just about 1 pound of the scrap to 10 pounds of the cracked corn and wheat. This is practically the proportion eaten when the moist mash was used.

## THE FEEDING TROUGH.

The difficulty of keeping the feed clean and dry during continued exposure is nearly overcome by using troughs with slatted sides and broad, detachable roofs (figs. 2 and 3). The troughs are from 6 to 10 feet long, with the sides 5 inches high. The lath slats are 2 inches apart, and the troughs are 16 inches high from floor to roof. The roofs project about 2 inches at the sides and effectually keep out the rain except when high winds prevail.

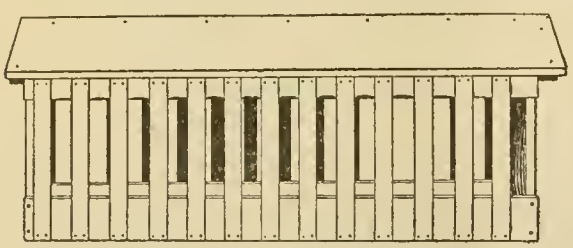

FIG. 2.—Chicken feeding trough, accessible from both sides, with cover on

The roof is very easily removed by lifting one end and sliding it endwise on the opposite gable end on which it rests, as shown in figure 3. The trough can then be filled and the roof drawn back into place without lifting it. This arrangement is economical of feed,

keeping it in good condition and avoiding waste. When dry mash is used there may be considerable waste by the finer parts being blown

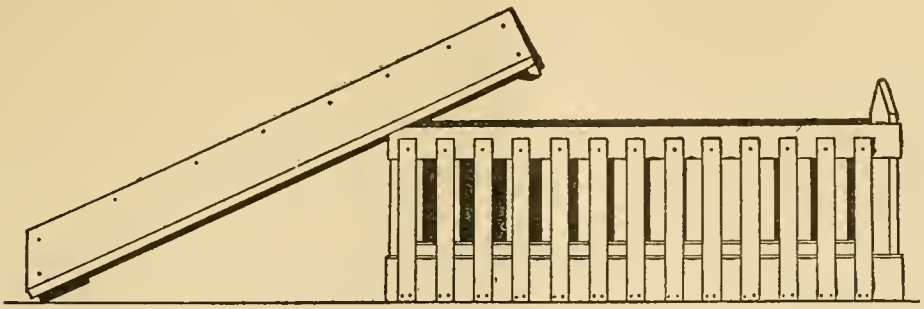

FIG. 3.—Chicken feeding trough with cover removed.

away, and on this account the dry-mash trough should be put in a sheltered place out of the reach of wind.

## FEEDING THE COCKERELS FOR MARKET.

At the Maine station most of the cockerels are to be used for breeding purposes, and they are fed in flocks of about 100 on the range in about the same way as the pullets. The dry-feed method is now used for them as satisfactorily as for the pullets.

A very large proportion of the cockerels raised in New England are sent to the market alive, without being fattened. Quite extended experiments at the Maine station with many birds in different years indicate very clearly that keeping the cockerels for a few weeks with special feeding will add materially to the selling price. Not infrequently this will make the difference between loss from the low price obtained for slow-selling unfattened birds and the profit from comparatively quick-selling specially fed birds at a much higher price. The higher price is due partly to the increased weight and partly to the superior quality of the well-covered soft-fleshed chickens. As the bulletins containing the results of these feeding experiments with cockerels are out of print, the following brief summary of the results obtained is given:

The number of pounds of grain required to produce 1 pound of gain in fattening cockerels was ascertained in experiments comparing (1) the effect of housing, (2) the effect of age, and (3) the effect of skim milk. The grain mixture used in these series of experiments was the same, consisting of 100 pounds of corn meal, 100 pounds of wheat middlings, and 40 pounds of meat meal. This was fed as a porridge thick enough to drop but not to run from a spoon.

The French and English fatteners who make a specialty of the business, fattening thousands of chickens each year, confine the chickens in small coops. The coops used at the Maine station gave a floor space of 16 by 23 inches, in each of which 4 chickens were placed. The

coops were constructed of laths with closed-end partitions of boards. The floors, sides, and tops were of laths placed three-quarters of an inch apart. By simply moving the pens thus constructed the floors were kept clean. V-shaped troughs with 3-inch sides were placed in front and about 2 inches above the level of the floors of the coops. Cockerels thus fed were compared with others kept in small houses 9 by 11 feet in size, with an attached yard 20 feet square. The yard was entirely free from anything that would serve as green feed. Twenty birds were put in each of these houses. As a result of experiments with fattening 286 birds it was found that on the average 7.9 pounds of grain were required to produce 1 pound of gain in the case of birds fed in the coops, and 5.9 pounds in the case of those fed in the small houses and yards.

An experiment with 150 birds when they were 4 months old showed that they required 4.9 pounds of grain to produce 1 pound of gain, while birds from the same stock, when they were 6 months old, required 7.4 pounds of grain to produce 1 pound of gain.

An experiment with 68 birds showed that when the porridge was wet with skim milk only 4.3 pounds of grain were required to produce 1 pound of gain, against 5.3 pounds when the porridge was wet with water. Eight pounds of skim milk was used with each pound of grain.

These experiments warrant the following conclusions: (1) As great gains are made just as cheaply and more easily when the chickens are put into small houses and yards as when they are fed in small lots in lattice coops just large enough to hold them. (2) Four weeks is about the limit of profitable feeding, both individually and in flocks. (3) Chickens gain faster while young. Birds that are from 150 to 175 days old have uniformly given comparatively small gains. (4) The practice of successful poultrymen selling chickens at the earliest marketable age is well founded. The spring chicken sold at Thanksgiving time is an expensive product.

The experiments clearly indicate that it is profitable to fatten chickens in cheaply constructed sheds or in large coops with small runs for about four weeks and then send them to market dressed. In quality the well-covered, soft-fleshed chickens are so much superior to the same birds not specially prepared that the former will be sought for at a higher price. The dairy farmer is particularly well prepared to carry on this work, as he has the skim milk which these experiments show to be of so great importance in obtaining cheap rapid growth and superior quality of flesh.

## HOUSING THE HENS.

When work in poultry management was first undertaken at the University of Maine, the hens were kept in small colonies in accord with what was at that time believed to be the best practice. Houses

10 feet square were erected with the idea of accommodating about 15 birds each. Although the houses were well warmed they were apt to be damp and lined with white frost in very cold weather, when the windows had to be kept shut to protect the birds from cold at night. Another disadvantage of this kind of house is its small size. A person can not care for hens in such small pens without getting them into a condition of unrest for fear of being cornered in such a small room. The question of extra labor in caring for hens in these small colonies scattered over quite a large area is an important factor in a commercial plant. When the Maine station began experiments in 1897 a warmed house 150 feet long by 16 feet wide was erected. As before mentioned, this house was burned the next spring, but was replaced by another of the same kind. This warmed house, while constructed after the most approved model of the time, has never been a satisfactory house for laying hens. In recent years it has been used only for the keeping of surplus stock and for carrying cockerels over the winter. It has now been abandoned entirely in favor of curtain-front houses to be described below.

### THE ROOSTING-CLOSET HOUSE.

Seven years ago one of the 10-foot square houses described above was taken for a nucleus and an addition made, so that the reconstructed house was 10 feet wide and 25 feet long. The inside end of the old house was taken out, so that there is one room with a floor space of 250 square feet. The walls are about 5½ feet high in the clear inside of the building. The whole of the front wall is not filled in, but a space 3 feet wide and 15 feet long is left just under the plate. This space had a frame covered with white drilling, hinged at the top on the inside, so it can be let down and buttoned during driving storms and winter nights, but hung up out of the way at all other times. The cloth of the outer curtain is oiled with hot linseed oil. The roost platform extends the whole length of the back of the room. It is 3 feet 4 inches wide and 3 feet above the floor. The back wall and up the roof for 4 feet is lined and the space filled and packed hard with fine hay. The packing also extends part way across the ends of the room.

Two roosts are used, but they do not take the whole length of the platform, a space of 4 feet at one end being reserved for a crate where broody hens can be confined until the desire for sitting is overcome. The space, from the front edge of the platform up to the roof, is covered by frame curtains of drilling, similar to the one on the front wall, except that it is not oiled. They are hinged at the top edge and kept turned up out of the way during daytime, but from the commencement of cold weather until spring they are closed down every

night after the hens go to roost. The hens are shut in this close roosting closet and kept there during the night, and are released as early in the morning as they can see to scratch for the grain which is sprinkled in the 8-inch deep straw on the floor.

The roosting closet has been closely observed and has never been damp or its odors offensive when opened in the mornings. There was very little freezing in the closets in the coldest weather. The birds seemed to enjoy coming out of the warm sleeping closet down into the cold straw, which was always dry, because the whole house was open to the outside air and sun every day. There were no shut-off corners of floor or closet that were damp.

This building was used through five winters with 50 hens in it. The birds laid as well as the others in the large warmed house; their combs were red and their plumage bright, and they gave every evidence of perfect health and vigor. While they were on the roosts they were warm. They came down to their breakfasts and spent the day in the open air. Such treatment gives vigor and snap to the human being, and it seems to work equally well with the hen.

This house was given the name of the "pioneer" house.

## CURTAIN-FRONT HOUSES.

The result of the use of the "pioneer" house indicated that this was a correct system of treating and housing hens, and it was decided to build several houses on the same plan and join them together under one roof as one house.

A curtain-front house 12 feet wide by 150 feet long, known as house No. 2, was erected in 1903. The back wall is 5 feet 6 inches high from floor to top of plate inside, and the front wall is 6 feet 8 inches high. The roof is of unequal span, the ridge being 4 feet in from the front wall; and the height of the ridge above the floor is 9 feet. The sills are 4 by 6 inches in size and rest on a rough stone wall laid on the surface of the ground. A central sill gives support to the floor, which at times is quite heavily loaded with sand. The floor timbers are 2 by 8 inches in size and are placed 2 feet apart; the floor is of two thicknesses of hemlock boards. All the rest of the frame is of 2 by 4 inch stuff. The building is boarded, papered, and shingled on roof and walls. The rear wall and 4 feet of the lower part of the rear roof are ceiled on the inside of the studding and plates, and the space between inner and outer walls is packed very hard with dry sawdust. In order to make the sawdust packing continuous between the wall and roof, the wall ceiling is carried up to within 6 inches of the plate; then follows up inclining pieces of studding to the rafters, the short pieces of studding being nailed to the studs and rafters. By this arrangement there are no slack places

around the plate to admit cold air. The end walls are packed in the same way. The house is divided by close-board partitions into seven 20-foot sections; one 10-foot section is reserved at the lower end for a feed-storage room.

Each of the 20-foot sections has two 12-light outside windows screwed onto the front, and the space between the windows (which is 8 feet long) for a distance of 3 feet down from the plate is covered during rough winter storms and cold nights by a light frame covered with 10-ounce duck, oiled and closely tacked on. This door, or curtain, is hinged at the top and swings in and up to the roof when open.

In the front of each section is a door 2 feet 6 inches wide. The roost platform is at the back of each room and extends the whole 20 feet. The platform is 3 feet 6 inches wide and 3 feet above the floor. The roosts are of 2 by 3 inch stuff placed on edge and are 10 inches above the platform. The back one is 11 inches out from the wall, and the space between the two roosts is 16 inches, leaving 15 inches between the front roost and the duck curtain, which is sufficient to prevent the curtain being soiled by the birds on the roost. The two curtains in front of the roost are similar to the one in the front of the house, except that they are not oiled. They are each 10 feet long by 30 inches wide, hinged at the top, and open into the room and fasten up when not in use. Great care was exercised in constructing the roosting closets to have them as nearly air-tight as possible, except as air might come in through the cloth curtain.

Single pulleys are hung at the rafters, and by means of a rope fastened to the lower edge of the curtain frames it is easily raised or lowered and kept in place.

Six trap nests are placed at one end of each room and four at the other. They are put near the front so that the light may be good for reading and recording the numbers on the leg bands of the birds. Several shelves are put on the walls 18 inches above the floor for shell, grit, bone, etc. The doors which open from one room to another throughout the building are frames covered with 10-ounce duck, so as to make them light, and are hung with double-action spring hinges. The advantages of having all doors push from the person passing through are very great; otherwise they would hinder the passage of the attendant with his baskets and pails. Strips of old rubber belting are nailed around the studs which the doors rub against as they swing to, so as just to catch and hold them from being opened by the wind. Tight board partitions are used between the pens instead of wire, so as to prevent drafts. An outside platform 3 feet wide extends across both ends and the entire front of the building.

This house accommodates 350 hens—50 in each 20-foot section—is well made of good material, and should prove to be durable. A

rougher building, with plain instead of trap nests, and with the roof and walls covered with some of the prepared materials instead of shingles, could be built for less money, and would probably furnish as comfortable quarters for the birds. The interior of one section of this house is shown in figure 4.

Curtain-front house No. 3 was constructed in 1904. It is 16 feet wide by 120 feet long, and is of the same style as No. 2, except that it is wider. There are four pens in the building, each 16 feet wide by 30 feet long. Two of the pens are arranged for 100 hens each, and two for 150 each. For the 150 hens three roosts instead of two are required.

The cloth-covered fronts of the closets where 100 and 150 hens roost are of the same size, and it became evident early in the first winter

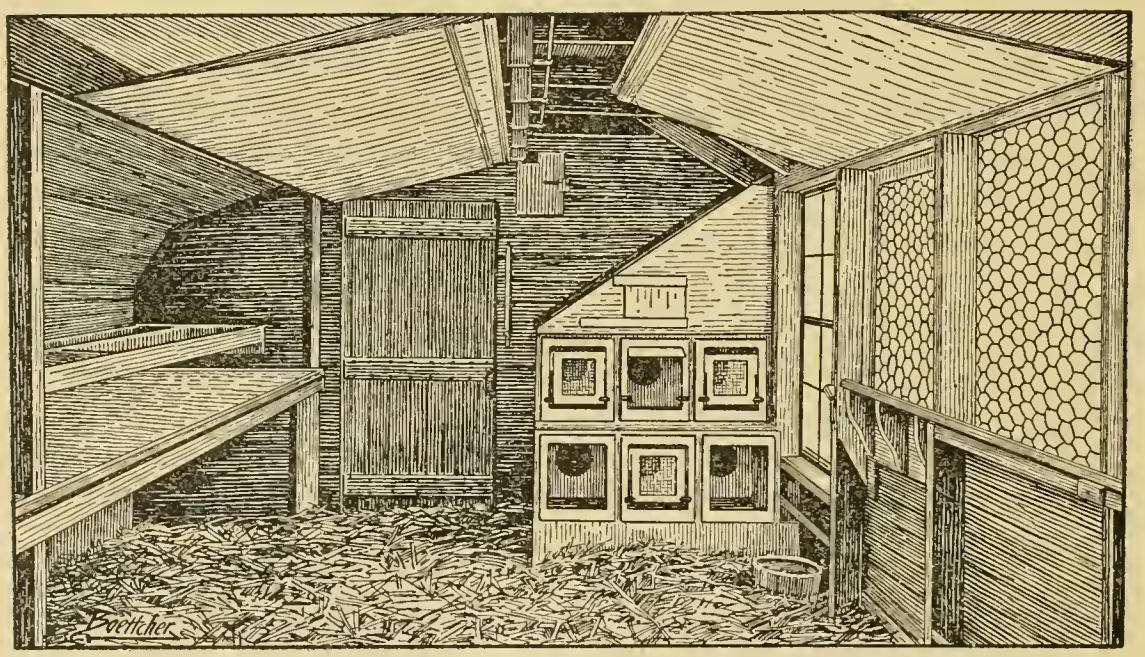

FIG. 4.—Interior of curtain-front poultry house No. 2.

that the supply of fresh air to the largest flock was not sufficient. It was not practicable to increase materially the cloth surface and allow more air to filter in, so three openings were made in the upper part of the curtain frame, through which better ventilation could be secured. The openings are 6 inches wide by 30 inches long and are provided with wooden shutters. These are kept wide open into the outer room during mild nights, but when high winds prevail and the temperature falls to 10 or more degrees below zero the openings are half closed.

The walls of the elevated closet are packed with sawdust 4 inches in thickness, and the curtains fit very closely, leaving only small cracks. The 10-ounce duck of which the curtains are made is not oiled. The supply of fresh air is mostly admitted through the cloth, while the breathed warmer air passes off through the openings above. By this

arrangement the birds are not in drafts or currents of air. Where three roosts are arranged abreast, instead of two, the openings are absolutely essential, and for smaller flocks they are convenient during the mild nights, especially toward spring.

**The latest form of curtain-front house.**—During the summer of 1905 the management of a commercial poultry plant in Orono built a curtain-front house to accommodate 2,000 laying hens. This was built in accordance with unpublished plans prepared by the Maine Experiment Station. The description is here given, as it represents the latest development of this style of house. The appearance of the house as a whole is shown in figure 5.

The house is 20 feet wide by 400 feet long, and is divided into 20 sections, each being 20 feet square. It is on the same general plan as houses Nos. 2 and 3 just described, but house No. 2 is 12 feet wide, house No. 3, 16 feet wide, and this one 20 feet wide. The widths have been increased in the last two houses, as experience has shown the advisability of it. At first it was thought the houses should be nar-

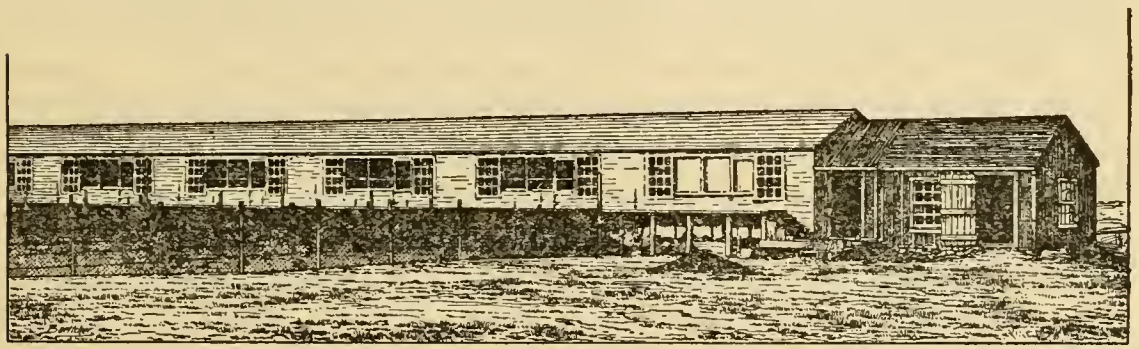

FIG. 5.—The latest curtain-front poultry house.

row so they might dry out readily, but the 20-foot house dries out satisfactorily, as the opening in the front is placed high up so that the sun shines in on the floor to the back in the shortest winter days.

The economy in the cost of the wide house over the narrow ones, when space is considered, is evident. The front and back walls in the narrow house cost about as much per linear foot as those in the wide house, and the greatly increased floor space is secured by building in a strip of floor and roof running lengthwise of the building. The carrying capacity of a house 20 feet wide is 66 per cent greater than that of a house 12 feet wide, and it is secured by merely building additional floor and roof. The walls, doors, and windows remain the same as in the narrow house, except that the front wall is made a little higher. Three sills, which are 6 inches square, run lengthwise of the house, the central one supporting the floor timbers in the middle. They rest on a rough stone wall, high enough from the ground for dogs to go under the building to look after rats and skunks that might incline to make their homes there. The stone wall rests on the surface of the ground,

and there are openings in it like cellar windows, every 20 feet, to allow the air to draw through and keep the basement dry during the summer. The floor timbers are 2 by 8 inches in size and rest wholly on top of the sills. All wall studs rest on the sills; the front ones are 8 feet long, and the back ones 6 feet 6 inches long. The two sides of the roof are unequal in width, the ridge being 8 feet from the front wall. The height of the ridge from the sill to the extreme top is 12 feet 6 inches. All studding is 2 by 4 inches in size and the rafters are 2 by 5 inches. The building is boarded with 1-inch boards, and is papered and shingled with good cedar shingles on walls and roof. The floor is of two thicknesses of hemlock boards which break joints in the laying.

The building is divided by tight board partitions into twenty sections, each section being 20 feet long. All of the sections are alike in construction and arrangement. The front side of each section has two storm windows of twelve lights of 10 by 12 inch glass. These windows are screwed on upright and 2 feet 8 inches from each end of the room; they are 3 feet above the floor. The distance between the windows is 8 feet 10 inches, and the top part of it to a depth of 3 feet 6 inches from the plate is not boarded but is left open to be covered by the cloth curtain when necessary. This leaves a tight wall 3 feet 10 inches high extending from the bottom of the opening down to the floor, which prevents the wind from blowing directly on the birds when they are on the floor. A door is made in this part of the front wall for the attendant to pass through when the curtain is open. A door 16 inches high by 18 inches wide is placed close to the floor under one of the windows for the birds to pass through to the yards in front. A similar door is in the center of the back wall to admit them to the rear yard when it is used.

A light frame made of 1 by 3 inch pine strips and 1 by 6 inch crossties is covered with 10-ounce white duck and hinged at the top of the front opening, which it covers when closed down. This curtain is easily turned up into the room, where it is caught and held by swinging hooks until released.

The roost platform is made tight and extends along the whole length of the room against the back wall. It is 4 feet 10 inches wide and 3 feet above the floor, being high enough for a person to get under it comfortably when necessary to catch or handle the birds. There are three roosts framed together in two 10-foot sections. The tops of the roosts are 1 foot above the platform and hinged to the back wall, so they may be turned up out of the way when the platform is being cleaned. The back roost is 12 inches from the wall, and the spaces between the next two are 16 inches. They are made of 2 by 3 inch spruce lumber placed on edge with the upper corners rounded off.

The roosting closet is shut off from the rest of the room by curtains similar to the one described above. For convenience in handling there are two of these curtains, each 10 feet long. They are 3 feet wide and are hinged at the top so as to be turned out and hooked up. The space above this curtain is ceiled and in it are two openings each 3 feet long and 6 inches wide for ventilating the roosting closet when necessary. In every compartment there is a door placed 5 inches out from the edge of the roost platform. These doors are 3 feet wide and 7 feet high, divided in the middle lengthwise, and each half is hung with double-acting spring hinges, allowing it to swing open both ways and close.

Ten nests are placed in two tiers against the partition in each end of the room. They are of ordinary form, each nesting space being 1 foot wide, 1 foot high, and 1 foot long, with the entrances near the partition, away from the light, and with hinged covers in front for the removal of the eggs. Each section of 5 nests can be taken out without disturbing anything else, cleaned, and returned. In constructing the house it was designed to use these nests only during the first year. The framework where they rest was arranged for the use of trap nests, which were installed in October, 1906.

Troughs similar to those described on page 18 are used for feeding dry mash, shell, bone, grit, and charcoal.

Two lines of 4 by 4 inch spruce are arranged as an elevated track above the doors. The track extends the entire length of the building, and being faced with narrow steel bands on top, a suspended car is readily pushed along, even when heavily loaded. The car platform is 2 by 8 feet in size, and is elevated a foot above the floor. All feed and water are carried through the building on this car. Ten iron baskets, into which the accumulations on the roost platforms are cleaned every morning, are put on the car, and collections are made as the car passes on through the pens to the far end of the building, 400 feet away, where the roost cleanings are dumped into the manure shed. As the car is pushed along a guard at the front end comes in contact with the doors and pushes them open, and they remain open until the car has passed on, when the spring hinges force them to close again. This car is a great saver of labor, as it does away with nearly all carrying by the workmen. It has enabled one man to take good care of the 2,000 hens from November to March, except on Saturdays, when the litter was removed and renewed by other men.

At one end of the building there is a temporary feed and water house, also used for dish washing and scalding, where the car remains when not in use.

There is a walk outside of the building, extending along its entire front. It is 4 feet wide, made of 2-inch plank, and is elevated 2 feet

above the floor of the building, which allows the doors below it, through which the birds pass to the front yards, to be opened and closed without interference. The door which opens out of each room

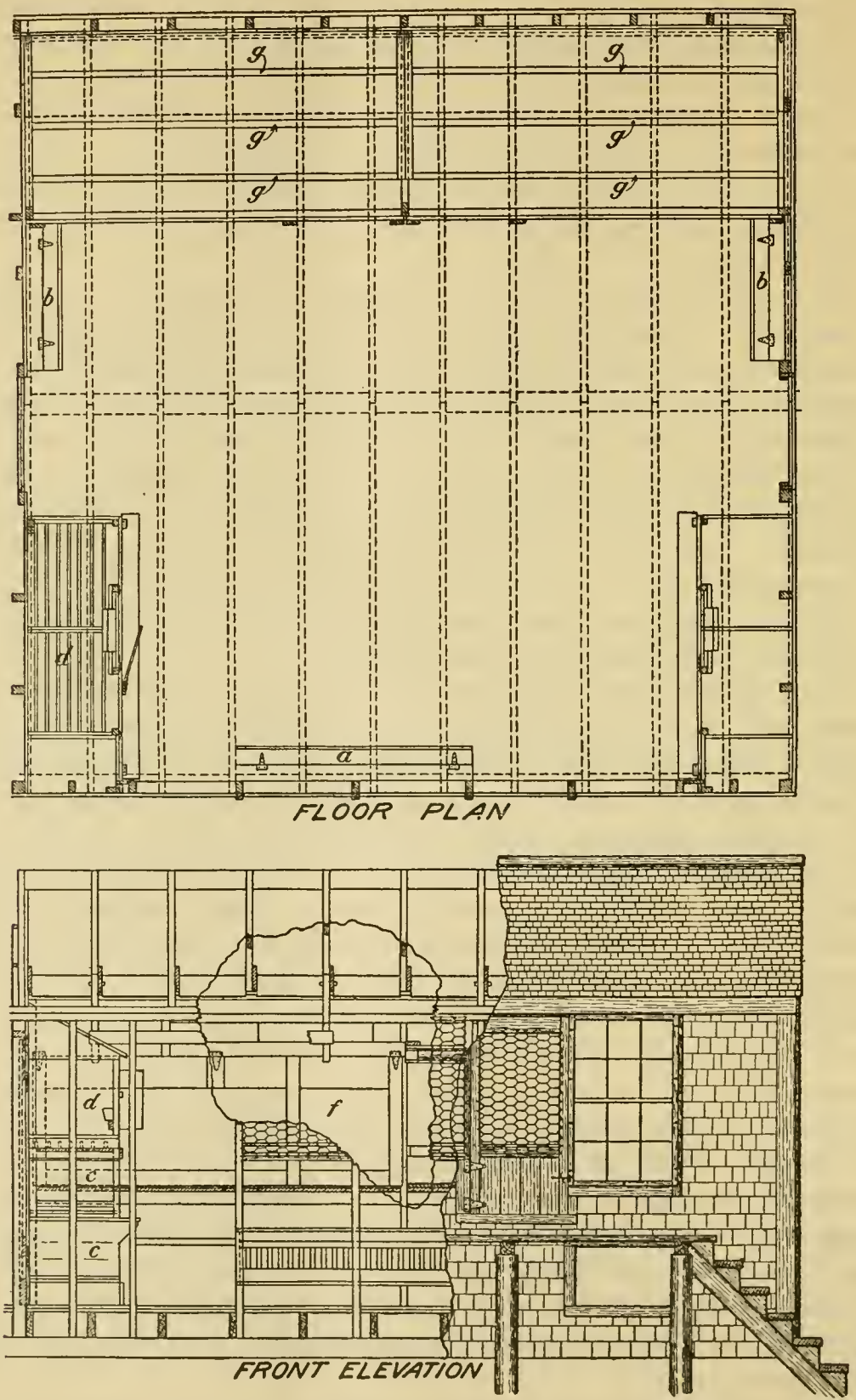


FIG. 6.—Floor plan and front elevation of section of latest curtain-front poultry house. *a*, Feed trough for dry mash; *b*, feed trough for grit, bone, etc.; *c*, trap nest; *d*, coop for broody hens; *e*, front curtain; *f*, roosting closet curtain; *g*, roost bars; *h*, small closet in which eggs taken from nest are placed.

through the curtain section is above the outside walk and necessitates stepping up or down when passing through, which is not a very serious objection, as the door is used but little in the daily work, but mostly in the weekly cleaning out and renewing of the floor litter. A guard of wire poultry netting 1 foot wide along the outside of the walk prevents the birds from flying from the yards up to the walk. The advantage of the elevated walk over one on a level with the sill of the building is that it is unobstructed by gates, which, were the low walk used, would be necessary to prevent the birds passing from one yard to another.

Detailed working drawings and specifications for one section or unit of this curtain-front house follow. From these data anyone can

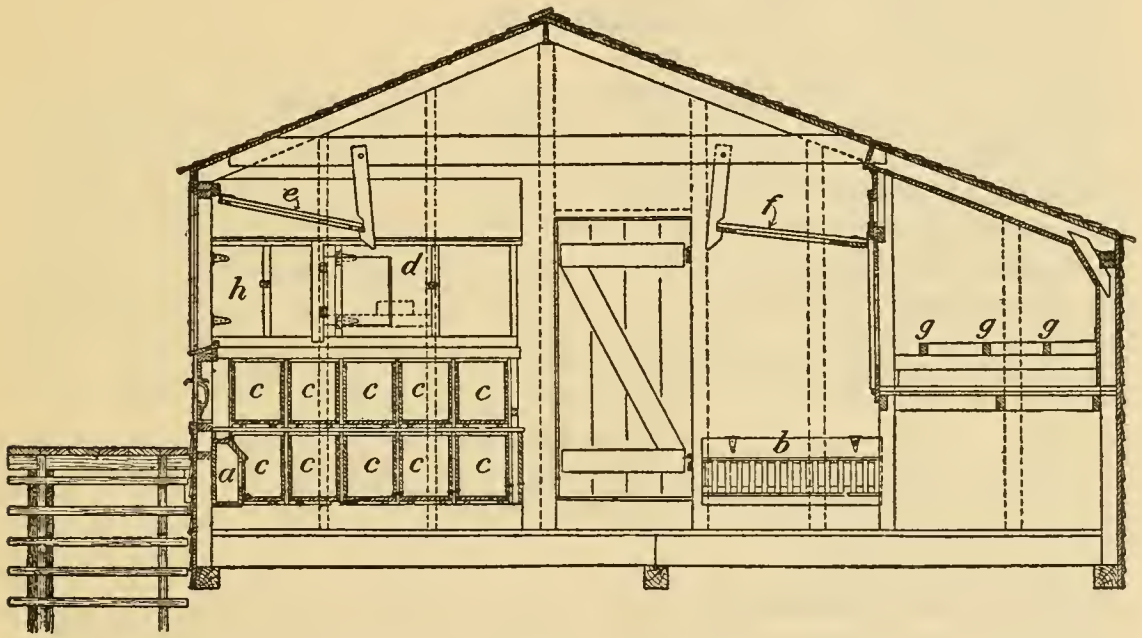


FIG. 7.—End elevation (inside) of latest curtain-front poultry house. (For key to letters, see fig. 6.)

figure what will be the cost of building one of these houses of any desired length at the prices of building material current in his locality.

Material needed for a unit of curtain-front house:

LUMBER.

(Spruce is specified simply because that is the material actually used in the building described. Any other equally strong lumber may be used. Amounts are given in board feet unless otherwise specified.)

The following estimates do not allow for waste in cutting.

8 cedar posts, 6 feet long, 6-inch butts.

350 feet 2 by 4 inch spruce for studs, door, window, and coop frames.

650 feet 2 by 8 inch plank for floor joists, outside walk, etc.

180 feet 6 by 6 inch spruce for sills.

26 feet 4 by 4 inch spruce for corner studs and wall stringers.

40 feet 2 by 3 inch spruce for roosts, etc.

215 feet 2 by 5 inch spruce for rafters.

39 feet 2 by 9 inch spruce for steps.

12 feet 2 by 6 inch spruce for step frames.

110 feet 1 by 8 inch boards, spruce, for braces for rafters.
38 feet 1 by 9 inch boards, spruce, for doors.
10½ feet per door 6-inch boards, spruce, for door braces.
2,300 feet boards, spruce or hemlock, for outside boarding, walls, floor, roof, etc.
100 feet boards, spruce, for roost frames.
40 linear feet 2 by 2 inch spruce planed to 1¾ by 1¾ inches.
6 feet 2 by ¾ inch spruce.
55 feet spruce boards for feed and grit troughs.
50 feet pine for curtain frames.
20 laths.
6,000 cedar shingles.

HARDWARE.

1 pair double-acting spring hinges with screws.
1 pair 6-inch heavy T hinges with screws.
7 pairs 5-inch light T hinges with screws.
4 pairs 3-inch light T hinges with screws.
2 pairs 2 by 2 inch butts with screws.
5 pairs 3 by 3 inch butts with screws.
2 dozen No. 10 screws 2 inches long.
20 pounds 3-penny shingle nails.
75 pounds 8-penny common nails.
25 pounds 10-penny common nails.
10 pounds 20-penny common nails.
2 pounds 3-penny clinch nails.
1 pound ¾-inch staples.
2 thumb latches complete with screws.

MISCELLANEOUS.

2 storm windows, 12 lights, 10 by 12 inch glass.
6 squares building paper.
10 feet 42-inch poultry netting.
3 yards 42-inch, 10-ounce duck.
7 yards 30-inch, 10-ounce duck.

**Advantages of curtain-front houses.**—The "pioneer" house was in use for five years with 50 pullets in it each year; the No. 2 house has been in use five years with 300 pullets each year, the No. 3 house four years, and the house last described three years. Besides these four houses, the Maine station has had the use of another house of the open-front style of construction for six years with about 200 1-year-old breeding hens in it each year.

Maine is subject to long spells of severe cold weather, with the temperature considerably below zero at night, and about zero during the day, and with a good deal of high wind. During such rough weather the bedding on the floor has kept comparatively dry; and the voidings on the platform, when the curtains are raised in the mornings, have been but slightly frozen. The yields of eggs during severe weather and immediately following it are rarely below those immediately preceding it. It should be borne in mind that had the weather been mild all that time the hens probably would have increased in pro-

duction rather than remained stationary. They are doubtless affected by the severe weather, but not seriously, as they uniformly begin to increase in production very soon after the weather becomes normal for midwinter.

These curtain-front houses have all proved eminently satisfactory. Not a case of colds or snuffles has developed from sleeping in the warm elevated closets, with their cloth fronts, and then going directly down into the cold room, onto the dry straw, and spending the day in the open air. The egg yields per bird have been as good in these houses as in warmed ones. The purpose of having rooms and flocks of different sizes was to compare the welfare and egg yields of the birds under the different conditions.

## THE YARDS.

The yards to most poultry houses are at the south, or on the sheltered sides of the buildings, to afford protection during the late fall and early spring, when cold winds are common. The warmed house had yards on both north and south sides, with convenient gates. The south yards were used until the cold winds were over in spring, when the hens were allowed to go to the north yards, which were well set in grass sod. With the curtain-front houses the yards need be on the north side only. The birds are kept in the building until the weather is suitable for opening the small doors in the rear wall. The necessity for getting them out of the open-front house, where they are really subject to most of the out-of-door conditions during the daytime, is not so great as when they are confined in closed houses with walls and glass windows. The clear, open fronts of the curtain-front houses allow teams to pass close to the open door of the pens for cleaning out worn material and delivering new bedding, and also allow attendants to enter and leave all pens from the outside walk and reach the feed room without passing through intervening pens.

## FEEDING THE HENS.

For about twenty-five years the same family of Barred Plymouth Rocks has been carried at the University of Maine, and one way has been learned to feed and handle them to secure eggs and to avoid the losses from overfatness, which are so common to mature hens of that breed. It is not claimed or thought that the methods of feeding here given are ideal; other methods may be as good or even better. These methods have, however, given good results at the Maine station. While it is true that only the full-fed hen can lay to the limit of her capacity, it is equally true that full feeding of the Plymouth Rocks, unless correctly done, results disastrously.

Years ago the "morning mash," which was regarded as necessary to "warm up the cold hen," so she could lay that day, was given up.

The method of feeding now employed is in detail as follows: Early in the morning for each 100 hens 4 quarts of whole corn is scattered on the litter, which is 6 to 8 inches deep on the floor. This is not mixed into the litter, for the straw is dry and light, and enough of the grain is hidden so the birds commence scratching for it almost immediately. At 10 o'clock they are fed in the same way 2 quarts of wheat and 2 quarts of oats. This is all of the regular feeding that is done.

The use of corn and corn meal as major parts of the feed of hens kept for egg production has been very generally condemned by poultrymen and farmers, until it is now used only as a very minor part of the ration for the fear that its use will cause overfatness and interfere with egg making. When used more freely and made a prominent factor in the ration it has been thought best to have the kernels broken, so that in hunting and scratching for the small pieces the birds might get the exercise needed to keep themselves in health and vigor. It was reasoned that even a small quantity of whole corn could be readily seen and picked up from the straw litter with little exertion, and that the vices of luxury and idleness would follow. In order to test this view an experiment was carried out at the station in the winter of 1906–7 in which whole corn was substituted for cracked corn in the ration of 500 laying pullets. A control lot of 500 received cracked corn. All other conditions affecting the two lots were kept as nearly identical as possible. The result of the experiment was that there was no appreciable difference in regard to either egg production, health, or general well-being between the two flocks of birds.

Besides the dry whole grain a dry mash is kept always before the birds. Along one side of the room is the feed trough with its slatted front, and in it is kept a supply of dry meals mixed together. This dry-meal mixture or mash has the following composition:

| | Parts by weight. |
|---|---|
| Wheat bran | 2 |
| Corn meal | 1 |
| Middlings | 1 |
| Gluten meal or brewers' grains | 1 |
| Linseed meal | 1 |
| Beef scrap | 1 |

These materials are spread on the floor in layers one above another and shoveled together until thoroughly mixed, then kept in stock for supplying the trough. The trough is never allowed to remain empty.

The dry-meal mixture is constantly within reach of all of the birds, and they help themselves at will.

Oyster shell, dry cracked bone, grit, and charcoal are kept in slatted troughs, and are accessible at all times. A moderate supply of mangolds and plenty of clean water is furnished. About 5 pounds of clover hay cut into ½-inch lengths is fed dry daily to each 100 birds in winter. When the wheat, oats, and cracked corn are given, the birds are always ready and anxious for them, and they scratch in the litter for the very last kernel before going to the trough where an abundance of feed is in store.

It is very evident that the hens like the broken and whole grains better than the mixture of the fine, dry materials; yet they by no means dislike the latter, for they help themselves to it, a mouthful or two at a time, whenever they seem to need it, and never go to bed with empty crops, so far as noted. They apparently do not like it well enough to gorge themselves with it, and sit down, loaf, get overfat, and lay soft-shelled eggs, as is so commonly the case with Plymouth Rocks when they are given warm morning mashes in troughs.

Some of the advantages of this method of feeding are that the mash is put in the troughs at any convenient time, only guarding against an exhaustion of the supply, and the entire avoidance of the mobbing that always occurs at trough feeding when that is made a meal of the day, whether it be at morning or evening. There are no tailings to be gathered up or wasted, as is common when a full meal of mash is given at night. The labor is very much less, enabling a person to care for more birds than when the regular evening meal is given.

For green feed during winter and spring mangolds are used. They are liked by the birds, and when properly harvested and cared for remain crisp and sound until late spring. They are fed whole, by sticking them onto projecting nails about a foot and a half above the floor. Care must be exercised in feeding them, as they are a laxative when used too freely. On the average about a peck per day to 100 hens can be safely used. They would eat a much greater quantity if they could get it.

The average amounts of the materials eaten by each hen during the last year are about as follows:

| | Pounds. |
|---|---|
| Grain and the meal mixture | 90. 0 |
| Oyster shell | 4. 0 |
| Dry cracked bone | 2. 4 |
| Grit | 2. 0 |
| Charcoal | 2. 4 |
| Clover | 10. 0 |

## A POULTRY-HOUSE DISINFECTANT.

There can be no doubt that one absolutely necessary supply about every well-conducted poultry plant must be some sort of disinfecting solution. Furthermore, such a disinfectant ought to fulfill satisfactorily several requirements. In the first place, it must be inexpensive. Further, it must be powerful and certain in its action even in dilute solutions. Finally, it must be of such a character as not to injure the birds if it, by accident or design, comes in contact with them. There are a great many commercial disinfectants on the market. Some of the most successful and widely used of these have either a phenol (carbolic acid) or a cresol base. Many of these preparations are excellent and their excellence is attested by their very wide popularity among poultrymen. There is one objection, however, to all of them; that is, that they are relatively expensive. The farmer or poultryman who uses them pays a good round price for the manufacture of something which he could manufacture himself, the only cost in that event being the cost for the raw materials.

The station has carried on a number of experiments with disinfectants to find a material well suited to the needs of the poultryman which should at the same time be cheap and easy to manufacture. As a result of these experiments the conclusion has been reached that, on the whole, cresol is an excellent substance for poultry-house disinfection. Experiments of the Department of Agriculture [a] have shown that cresol is one of the most powerful germicides and disinfectants known. The experience of the station shows that in addition to the germicidal value of a cresol solution it has a very considerable value as a poultry insecticide. It has even been used with satisfactory results to rid hens of lice by direct spraying of the birds. A very small application in spray was found to rid a bird of lice without harmful effect to the bird itself.[b] Furthermore, in the experience of the station it is, when applied as a spray, very effective in ridding the houses, nests, etc., of lice.

Cresol may be stirred up directly with water and used as a spray. Since cresol is only slightly soluble in water it is better to make use of the "compound solution of cresol" (liquor cresolis compositus) of the United States Pharmacopeia.

Liquor cresolis compositus, or, as it may for convenience be called, cresol soap, may be easily manufactured by any poultryman. The

[a] McBryde, C. N. The Germicidal Value of Liquor Cresolis Compositus (U. S. P.). Bureau of Animal Industry Bulletin 100, pp. 1–24, 1907.

[b] We do not recommend this method of ridding birds of lice, because of the danger that the bird will take cold as a result of the wetting. This experiment was performed simply to test the value of the cresol solution as an insecticide under the most unfavorable conditions for its action.

only requisite is a careful attention to the details in the process and a rigid following of the instructions given below. In order to make clear the reasons for the method of manufacture which will be outlined it may be well to give some account of the nature of the substance itself. The active base or cresol soap disinfecting solution is commercial cresol. This is a thick, sirupy fluid varying in color in different lots from a nearly colorless fluid to a dark brown. It does not mix readily with water, and therefore in order to make satisfactorily a dilute solution it is necessary first to incorporate the cresol with some substance which will mix with water and will carry the cresol over into the mixture. The commercial cresol as it is obtained is a corrosive substance, being in this respect not unlike carbolic acid. It should, of course, be handled with great care, and the pure cresol should not be allowed to come in contact with the skin. If it does so accidentally the spot should be immediately washed off with plenty of clean water. The price of commercial cresol varies with the drug market. It can be obtained through any druggist. On the day that this is written the quotation on cresol in the New York market is 24 cents a pound. In purchasing this article one should order simply "commercial cresol."

The solution or soap referred to is made as follows: Measure out 4 quarts of raw linseed oil in a 4 or 5 gallon stone crock; then weigh out in a dish $1\frac{3}{4}$ pounds of commercial potassium hydroxid or caustic potash, which may be obtained from any druggist at a cost of from 10 to 15 cents a pound. Dissolve this caustic potash in one pint of water; let it stand for at least three hours until the potash is completely dissolved and the solution is cold; then add the cold potash solution very slowly to the linseed oil, stirring constantly. Not less than five minutes should be taken for the adding of this solution of potash to the oil. For five hours after mixing the oil and potash mixture (soap) should be stirred thoroughly about once every hour and then left standing for ten or twelve hours. By the expiration of that time saponification should be complete. The soap should then be stirred and broken up into small pieces and $5\frac{1}{4}$ quarts of commercial cresol should be added. The soap will slowly dissolve in this cresol. It may take two days for complete solution to be effected. The length of time taken in dissolving will depend on the condition of the soap, which in turn varies with different lots of linseed oil. When the soap is all dissolved, the solution, which is liquor cresolis compositus or cresol soap, is then ready to use. This cresol soap will mix in any proportion with water and yield a clear solution.

As has been said, cresol soap is an extremely powerful disinfectant. In the station poultry plant for general purposes of disinfecting the houses, brooders, brooder houses, incubators, nests, and other wood-

work it is used in a 2 per cent solution with water. Three or four tablespoonfuls of the cresol soap to each gallon of water will make a satisfactory solution. This solution may be applied through any kind of spray pump or with a brush. Being a clear watery fluid, it can be used in any spray pump without difficulty. For disinfecting brooders or incubators which there is reason to believe have been particularly liable to infection with the germs of white diarrhea or other diseases the cresol may be used in double the strength given above and applied with a scrub brush in addition to the spray.

The first consideration in choosing a disinfectant must be its effectiveness. It is a poor sort of economy to use a disinfectant which costs little and will kill few or no germs. Taking into account its effectiveness in dilute solutions, liquor cresolis compositus is believed to be one of the best and cheapest germicides and disinfectants available. The station is using it altogether in its own work and feels justified in recommending it to poultrymen.

## TRAP NESTS.

In all the experimental work with laying hens at the Maine station use is made of trap nests. During the past year a new type of trap nest[a] has been devised which is proving extremely satisfactory. The features in which this nest is superior to the type formerly used at the station are (1) certainty and precision of operation; (2) greater simplicity of construction, with less tendency to get out of order and work badly; (3) saving of labor in resetting the nest after use.

The nest is a box-like structure, without front, end, or cover, 28 inches long, 13 inches wide, and 16 inches deep, inside measure. A division board with a circular opening 7½ inches in diameter is placed across the box 12 inches from the rear end and 15 inches from the front end. Instead of having the partition between the two parts of the nest made with a circular hole, it is possible to have simply a straight board partition extending up 6 inches from the bottom, as shown in figure 8. The rear section is the nest proper.

The front portion of the nest has no fixed bottom. Instead there is a movable bottom or treadle which is hinged at the back end (fig. 8). To this treadle is hinged the door of the nest. The treadle

[a] While this bulletin was going through the press the writer was informed that a trap nest embodying certain features similar to those in the nest here described was in use at the Utah Agricultural Experiment Station. An examination of the bulletins of that station fails to disclose a description of such a nest. The nest here described was independently devised at the Maine station. Inasmuch as no description of the principle of trap-nest construction here made use of has hitherto been published, it is impossible to make any further acknowledgment of priority in the matter than is contained in the statement here made.

is made of ½-inch pine stuff, with 1½-inch hard-wood cleats at each end (figs. 9 and 10) to hold the screws which fasten the hinges. It is 12 inches wide and 12¼ inches long. Across its upper face just behind the hinges holding the door is nailed a pine strip 4 inches wide, beveled on both sides, as shown in figures 9 and 10. The door of the nest is not made solid, but is an open frame (figs. 8 and 10), to the inner side of which is fastened (with staples) a rectangular piece of ⅛-inch mesh galvanized screening (dimensions 8 by 9 inches). The sides of the door are strips of ¾-inch beech stuff 12 inches long and 1½ inches wide, halved at the ends to join to the top and bottom of the door. The top of the door is a strip of hard wood 13 inches long and 1½ inches wide, halved in 2¾ inches from each end. The projecting ends of this top strip serve as stops for the door when it closes (fig. 8). The bottom of the door is a hard-wood strip 10¼ inches by 4 inches. The side strips are fitted into the ends of this bottom strip in such way as to project slightly (about $\frac{1}{32}$ inch) above the front surface of that strip, for a reason which will be apparent.

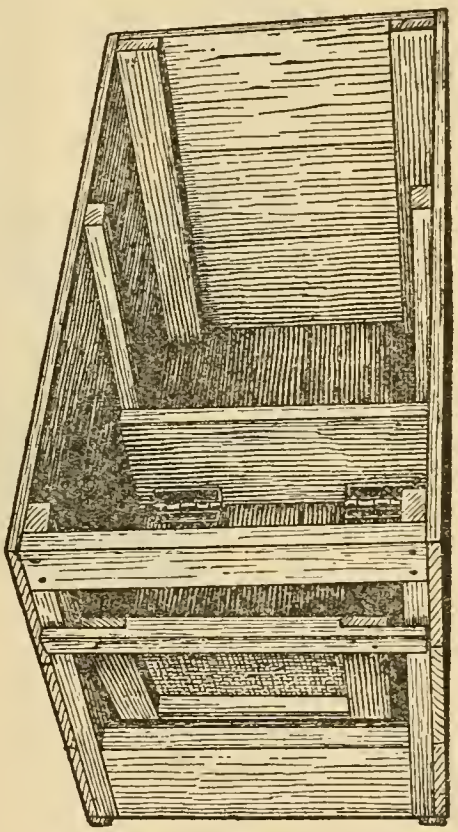

FIG. 8.—Trap nest closed. View from above.

When the nest is open the door extends horizontally in front, as shown in figure 9. In this position the side strips of the door rest on a strip of beech 1½ inches wide, beveled on the inner corner, which extends across the front of the nest. This beech strip is nailed to the top of a board 4 inches wide, which forms the front of the nest box proper. To the bottom of this is nailed a strip 2 inches wide, into which are set two 4-inch spikes from which the heads have been cut (compare fig. 9). The treadle rests on these spikes when the nest is closed. The hinges used in fastening the treadle and door are narrow 3-inch galvanized butts with brass pins, made to work very easily. It is necessary to use hinges which will not rust.

The manner in which the nest operates will be clear from an examination of figures 9 and 10, which show a sample nest with one side removed to show the inside. A hen about to lay steps up on the door and walks in toward the dark back of the nest. When she passes the point where the door is hinged to the treadle her weight on the treadle causes it to drop. This at the same time pulls the door up behind her,

as shown in figure 10. It is then impossible for the hen to get out of the nest till the attendant lifts door and treadle and resets it. It will be seen that the nest is extremely simple. It has no locks or triggers to get out of order. Yet by proper balancing of door and treadle it can be so delicately adjusted that a weight of less than half a pound on the treadle will spring the trap. All bearing surfaces are made of beech because of the well-known property of this wood to take on a highly polished surface with wear. The nests in use at the Maine station have the doors of hard wood, in order to get greater durability. Where trap nests are constantly in use, flimsy construction is not economical in the long run. For temporary use the nest door could be constructed of soft wood.

The trap nests are not made with covers because they are used in tiers and slide in and out like drawers. They can be carried away for cleaning when necessary. Four nests in a pen accommodate 20 hens

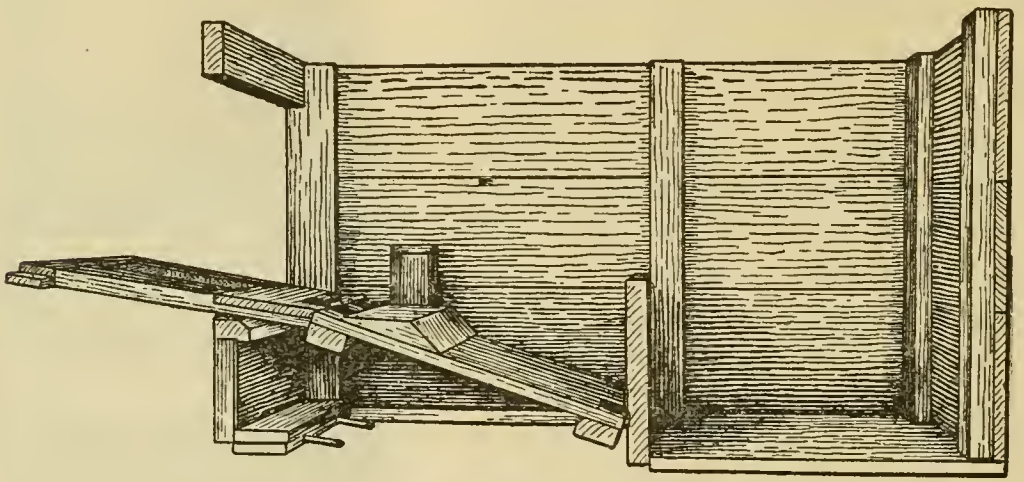

FIG. 9.—Trap nest open. One side removed to show method of operation.

by the attendant going through the pens once an hour, or a little oftener, during that part of the day when the hens are busiest. Earlier and later in the day his visits are not so frequent. The hens must all have leg bands in order to identify them; a number of different kinds are on the market. The double box with the nest in the rear is necessary. When a hen has laid an egg and desires to leave the nest, she steps out into the front space and remains there until she is released. With only one section she would be likely to crush her egg by stepping upon it, and thus learn the pernicious habit of egg eating.

To remove a hen, the nest is pulled part way out, and as it has no cover she is readily caught, the number on her leg band is noted and the proper entry made on the record sheet. After having been taken off a few times the hens do not object to being handled, most of them remaining quiet, apparently expecting to be picked up.

Before commencing the use of trap nests it was thought that some hens might be irritated by the trapping operation and object to the noise incident to it, but such does not seem to be the case. Trap nests have been used at the Maine station for Leghorns, Brahmas, Wyandottes, and Plymouth Rocks.

The amount of time required in caring for the trap nests can only be estimated, since the attendant's time is divided with other duties. The time varies from one day to another and with the number of nests

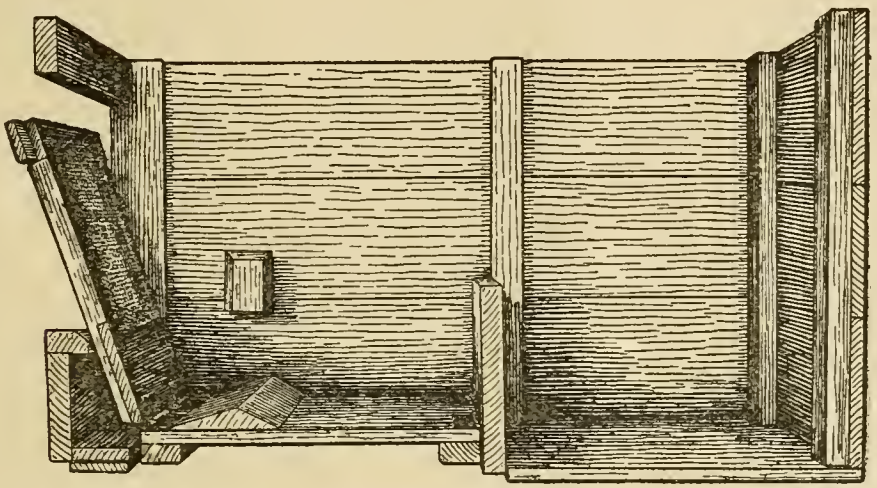

FIG. 10.—Trap nest closed. One side removed to show method of operation.

in use. By noting the total time used each day in caring for the nests when the hens were laying most heavily, it has been estimated that one active person devoting his entire time to trap nests could take care of 400 to 500 nests used by 2,000 to 2,500 hens. When commencing the year's work he would need assistance in banding the birds, but after that was done he could care for the nests without assistance until midsummer, when the egg yields would probably be diminished and a part of his time could be spared for other duties.



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## POULTRY POINTERS

1. Chickens are a good index to the owner's character. A fine pure bred flock indicates a progressive, successful farmer.

2. Select the best breed adapted to your conditions that suits your fancy. One breed is more satisfactory than several.

3. Breed from the best laying hens. Like begets like in chickens as elsewhere.

4. Early laying pullets are the most prolific egg producers.

5. "The cock is half the flock." One splendid bird mated with a few of the best hens will give far better chickens than half a dozen cheap roosters running with the entire flock.

6. Every old hen lays in April and May; and eggs selected from the whole flock at this time will number a large proportion from the poorest laying fowls.

7. Attend to the vermin on sitting hens. They often spoil the hatch and even destroy the hen before incubation is over.

8. Don't feed the young chick till he is two or three days old. He has his lunch basket with him when he leaves the shell.

9. Dry feed is best for young chicks.

10. Keep the chickens growing as fast as possible. Pullets hatched in April ought to lay by October.

11. Separate the sexes as early as they can be distinguished. They develop faster and more perfectly when kept apart.

12. Don't forget to give laying hens oyster shells or lime stone for the egg shells.

13. Meat must be provided to furnish protein for the eggs.

14. Destroy the vermin. Hens cannot produce many eggs with lice and mites sucking their life blood.

15. Don't keep birds too closely confined in winter. A tight house is apt to be damp and unhealthy.

16. Curtain front houses permit ventilation without draft and keep fowls dry and hardy.

17. The better the product, whether eggs or dressed poultry, the less the competition of producer and the stronger that of customers.